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## MYSORE ECONOMIC CONFERENCE.

BY THE EDITOR.

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IN a supplement to the last issue of the *Journal* we published the Order of the Government of Mysore in the matter of the reorganization of the Mysore Economic Conference. As now constituted, the Conference as such is made a permanent adjunct to the administration with a central organization consisting of officials and non-officials to advise upon questions of economic importance and to co-ordinate all activities to the best advantage. In the districts, economic development work will become an integralpart of the functions of the local self-governing bodies. The new central organization will consist of (1) a Central Board for organizing and co-ordinating the work of all the agencies to be known as the Economic Development Board, (2) three Boards corresponding to the three existing Central Committees, *viz.*, one for Education, one for Agriculture, and one for Commerce and Industries, and (3) a Board for Scientific Research and Advice. The General Conference will, in future, be a joint session of the Central Boards with other selected representatives, held once a year during the Birthday week to make suggestions and recommendations on questions of policy and call for information and discuss special measures to be adopted for promoting economic development in the State. The composition of the membership of the Central Board, *i.e.*, Economic Development, will not differ materially from that of the Standing Committee which it displaces, though its strength is reduced to some extent. The total number of members excluding the President and Vice-Presidents, will be limited to twenty. Elected members are to hold office only for one year at a time. The Secretary to Government, Agriculture and Education Departments, will be Ex-officio Secretary to the Board. He will not be a member of the Board. The Dewan will be its President and the members of Council will be Vice-Presidents. Six Heads of Departments and the Revenue Commissioner, Chief Engineer, Chief Electrical Engineer and the Financial Secretary will be members. Each of the three Boards (Education, Agriculture, and Commerce and Industries) will elect three members to it. The Board will meet once in every four months. Its functions will be to discuss questions of policy, to make suggestions to Government and to consider schemes and proposals sent by individual Boards or referred to it by Government. It cannot exercise any direct executive functions.

### THE CENTRAL BOARDS.

The Boards of Education, Agriculture, and Commerce and Industries as re-constituted will each have a member of Council, as now, as Chairman and excluding him will consist of not more than twenty-two. Each

chairman has, however, the power to co-opt additional members up to a limit of three—bringing the total to twenty-five. Opportunity is taken to provide representation on each Board of agencies working in the Districts, of the Representative Assembly and of other semi-official and private bodies in the State devoted to economic work of any importance and of any special interests (as planting associations, Inamdars, Chamber of Commerce, etc.) Each Board will have a whole time Secretary and members, nominated or elected, who can hold office only for one year. The Secretary will not, as now, be a member of the Board. The Boards will meet at least once in two months. The functions of the Boards will be the investigation of questions of Economic interest, carrying experiments, formulating schemes for improvements, collecting and spreading information of value by means of bulletins, lectures, etc., and generally advising the people in respect of measures to be adopted for their material and moral welfare. Ordinarily, the execution of schemes formulated by them and approved by Government shall rest with the Executive Department of Government. But in cases where Government specially so direct the Boards may themselves undertake the execution of any scheme prepared by them out of their budget. The Boards are allowed full initiative and financial autonomy subject to Budget provision. Larger powers are given to chairmen in regard to expenditure, the only limit being that no appointment carrying a salary of Rs. 100 or more can be made by them without the previous approval of Government.

### WORK IN THE DISTRICTS.

With regard to economic work in the Districts, it is considered no longer necessary to have separate District Committees for the purpose. The fuctions of these Committees are accordingly handed over to District Boards. The Local Boards Regulation will be amended suitably to impose the duty of promoting economic development work in each local area as an obligatory function on all District Boards. These Boards will have their three Sub-Committees (each to consist of not more then ten members) to correspond with the three Central Boards of Education, Agriculture, and Commerce and Industries. Separate rules will issue in regard to procedure, etc. Suitable grants will be given to the Boards to enable them to discharge the additional functions now delegated to them. The Presidents of District Boards will be held responsible for co-ordinating the work of the several agencies at work with a view to the attainment of practical results. They may appoint a special staff for special periods to carry out the work. This may include a special officer to work under the President, subject to the control of the Board, to assist the Board in co-ordinating the work of the various agencies in the District. District Boards will be responsible to Economic Development Board for the proper administration of the grants made to them. All executive work should, as far as possible, be carried out through the Departmental agency. Similarly in the case of Taluks, the Taluk Progress Committees will cease to exist, their functions being merged with or delegated to the Taluk Boards. In towns and cities, Municipal Councils are expected to undertake similar duties. In villages, Village Punchayats will attend to them and where these do not exist, the work will devolve on Village Improvement Committees.

### THE ECONOMIC CONFERENCE.

The Conference will meet once annually during the Birthday week at Mysore. Its membership is increased to one hundred—members of Central Boards, seventy-five; Deputy Commissioners of Districts, eight; members of Legislative Council to be elected, two; members of City Municipalities, two; members of Town Municipalities, four; nominated to represent communities and interests, nine. Elected

members hold office for three years while all nominated members should vacate their seats every year. The functions of the Conference will be purely advisory. It has the right to interpellate on any matter of economic interest. It may offer suggestions, pass resolutions, ask for information, and discuss the Budget. The Secretary to the Economic Development Board will be its Ex-officio Secretary.

FINANCE.

The Budget allotment of the Conference will be for the present Rs. 2 lakhs, the expenditure on establishment being limited to Rs. 75,000. Separate orders will issue regarding the permanent and other establishments to be attached to the various sections of the Conference organization.

INTERIM ORGANIZATION.

Pending the re-organization of the Conference on the above lines, Government direct that the existing arrangements should be continued till the end of December, 1919, by which time the arrangements for giving effect to the new order will be made. The District Board Presidents are requested to take the necessary steps to transfer all Economic development work in the districts to the several local bodies in their areas and submit detailed proposals regarding staff, etc., before 31st October, 1919. The District Economic Superintendents cease to exist on 1st January, 1920.

Such, in outline, is the new scheme sanctioned by Government. Its success will depend more hereafter upon the people. Especially in the Districts, greater work will be expected from the people. It is up to them to show that they are alive to the new responsibilities entrusted to them. The Central Committees will have, under the new scheme, all the initiative they have hitherto had. They ought, in our opinion, keep a watchful eye on the work in the districts. Much may be done by individual members and in the last resort work of this kind depends on the interest and enthusiasm that individual members can bring to bear on their work. In the past, there have been not wanting members who have taken the lead in the districts in work of this kind and as the field for their useful work is widened now, it seems but right to expect from them in the future even greater activity in the matter of Economic development.

## AN EDUCATION DELUSION.

BY V. SUBRAHMANYA IYER, B.A.

THAT the existing system of Indian Education has been somewhat too literary and theoretical is a complaint heard all over the country and that it needs early correction is generally admitted. But the question has still to be answered, what is the corrective? Does the remedy lie, as is sometimes proposed, in the adoption of schemes like *Universal* or *Compulsory* training in handicrafts, which, they say, largely obtain in some of the western countries?

That the hand is as valuable an instrument as the eye or the ear for the training of the mind, is the belief of many psychologists and "*Manual*" Training is accordingly becoming a part of general Education, in the earlier stages. But whether "*Industrial*" training in handicrafts like Carpentry and Smithy, serves the same end, or whether it is advisable to make it *Compulsory*, especially at the higher stages, are points on which there does not appear to exist much agreement.

Such as are by nature intellectually incapable of rising to a higher level than the Primary school, have necessarily to seek training in industrial work. *Compulsory* training in handicrafts for the great majority of such pupils would certainly be justifiable. And inasmuch as the use of the hand and the eye is an important item in the primary courses, *Universal* training in the elements of some handicrafts might serve a useful purpose. A measure of this kind would certainly be welcome.

When, however, this doctrine of *Universal* and *Compulsory* training in handicrafts, in the secondary and higher stages also is advanced, one cannot but demur to it. For, evidently, in so far as the pupils at this stage

show that they are capable of higher intellectual work, it is inconceivable why every one of them should be forced to spend one's time in the shoe-maker's or the tinsmith's workshop ?

If Universal literary education is a mistake, it does not require a different logic to show that Universal Industrial training is equally a mistake. Does nature intend that all men should be manual labourers ? Are all minds of the same mould ? Are not the variety of aptitudes and tastes to be turned to account by being provided with appropriate opportunities to develop ? Why should one with a mathematical or literary turn of mind waste time, and that the best part of his life, in plying bellows or in sawing timber.

Does not a community require *non*-manual services ? Is it justifiable to ignore such needs and *waste* the talents of men required for such work on the acquisition of manual skill ? Not that there is no dignity or joy in slinging with brawny arms, the heavy sledge, or in merrily driving the yoked team afield. But is it not unfair to "compel" every son of man to employ his talents in what will be of comparatively little use to him in later life ?

Or, again, granting that every boy or girl of a community sacrifices some of his or her best years and attains some skill in the handicrafts, where are *all* the trained men to find work ? Are they expected to seek work in other lands ? Such industrial education will no donbt yield an abundant crop of cheap but skilled workmen for other exploiters of labour. But is that the aim of our Education ?

If the theory of *Universal* or *Compulsory* training in handicrafts in the secondary and higher stages is thus psychologically, sociologically and economically untenable, is Industrial Education not a corrective ?

Industrial training is invaluable, nay, indispensable. But it should be given to those that have an aptitude for it. And even in the case of such as are destined to be manual workers, training in mere handicrafts on the lines hitherto followed in the West, is considered by competent authorities to be an undesirable course. For, the more the merely mechanical education in handicrafts is given the more mechanical the men and women become. The acquisition of manual skill is no indication of human superiority. For, even brutes with mechanical training perform wonderful feats in the circuses. Nicholas Butler, the well-known American authority on Education, not long ago said :

"The war has taught the lesson that........ to attempt to turn education into a merely mechanical process with a purely gainful end is nothing short of treason to the highest, most uplifting and most enduring human interests."

Nor is the Industrial Education of the kind now proposed to be given of any real value as an antidote to the existing evil. The schemes so far formulated are only an imitation of those adopted in western countries. And the results of such education those countries have already begun to deplore. Such education has been given, for instance, in England and France and this is what Mr. J. C. Paton (High Master, Manchester) has recently said, speaking of *Secondary* Education :

"The war has opened the eyes of the nation as never before to the weaknesses of our Industrial position."

The situation is not far different in France which has also had its scheme of Industrial Education:

Writing on 'Industrial Art Training,' J. P. Haney of New York says.

"France and England are now doing all that they can do to conserve every ounce of their own talent and prepare it for the commercial struggle coming with Peace treaty. Indeed all European countries are doing this

and information which has leaked out indicates that Germany also is doing everything possible, with selected pupils in her three score of Industrial Art schools to enable her art industries to enter the commercial field in the shortest possible time after the peace is signed."

What then is the defect in these systems? *Such education in manual work as does not enable the workman to adjust not only himself but also his craft to the changing conditions around, is bound to be a failure.* It is this that has tended, to a large extent, to kill the crafts in India in spite of the high degree of skill the workmen had at one time attained. What gives vitality to industrial education is technical *intelligence*,—in other words, scientific knowledge as applied to the different crafts, trades and industries. To quote Mr. Paton again:

"What has always been clear to a few is now patent to all, *viz.*, that without a higher standard and a wider range of *scientific* knowledge our nation stands to lose not only its industrial position but even its power of self-defence."

Neither mere imitation of foreign industrial schemes, especially those that are now considered effete, nor Universal compulsion will be of any avail. The real antidote to an overdose of literariness or bookishness, is not merely Carpentry or Smithy which only multiplies manual labourers and starves them to slow death, but the training in science and in its applications to every grade and kind of handicraft and of industries. It is this factor that directly increases one's efficiency as a workman in the worldwide struggle for existence. The application of science is not, as persons ignorant of science appear to imagine, confined to industries, such as, dyeing and weaving. It enters more and more into handicrafts, like carpentary and smithy also, where the scope for the use of *scientific* knowledge is growing every day.

It is a truism that in the world of Education "Uniformity" is death. And when it is combined with 'compulsion' matters become worse. Speaking on this subject Edmond Holmes, a no mean authority, says in one of his most recent essays:

"A cut and dried curriculum is imposed on them (pupils) with or without their consent, and no attempt is made to discover or help to discover in what direction their talents really lie. The result is that an arbitrary standard of intellectual worth is applied to them, by reference to which glaring inequalities among them speedily reveal themselves, inequalities...............ultimately decisive of destiny..................As the regime of compulsory discipline and compulsory instruction is distasteful to the health of the child in order to induce children to exert themselves they are urged and even compelled to compete against one another for prizes and other marks of distinction, and are thus taught to regard their classmates as rivals instead of as fellow workers and friends................*Give a child freedom for self-development, release him from the cramping and deadening pressure of..................mechanical instruction*..............his spirit for realizing capacity for *making the most of his natural aptitudes* and inclinations will at least be kept alive. With such a school-life behind him, he will be.....................ready to play his part as a useful and efficient member of the community." (The italics are mine).

Compulsion in the matter of *Education* is different from compulsion in the matter of *curricula*. The latter has to be avoided as far as possible. And it is a recognition of this fundamental principle that distinguishes modern Education from the old. And now, it is the old system that is sought to be reimposed, as if with a vengeance, by making mere *mechanical* training most obligatory.

If it is realized that intelligence or understanding is basic, *i. e.*, that it enters as a

common factor into the individual's success in every branch or subject of study, *compulsion* would be justified only in so far as it promotes the growth of this *common factor.* In all else, compulsion would be folly. Further, in the Secondary and Higher stages such schemes as fail to provide first and foremost for the exercise of intelligence by the application of scientific knowledge not only to industrial arts but also to hadicrafts of all grades and kinds, be they carpentry and smithy or weaving and dyeing, or agriculture and apiculture, will lack that which is really life unto them. To ignore *science* as a part of such scheme is to starve intelligence, and to seek to produce automatons and slaves. But the need of the hour is not Industrial slavery but industrial self-reliance.

In other words, the evil of modern education is, as has been often said, its excess of "*intellectuality.*" And in fighting against this evil, reformers, not infrequently mistake "*intelligence*" for it, and seek to kill it forgetting that it is intelligence that is the most vital part of education. And there is no greater delusion than to think that the counterpoise to *literariness* is mere *mechanical* training in Industries. Woe unto the land that relies upon industrial or technical education without science!

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Major David Davies, M. P., is at the head of a new cinema enterprise which proposes to erect "Super Cinemas" in England and India and to supply films all over the Empire. Two companies with a joint capital of £1,600,000 have already been formed and others will follow. It is proposed among other developments to make first class films based on British books. Another important phase of the undertaking will be the filming of great British industries such as coal, iron, steel, cotton and wool. In fact it is the intention to draw attention to Great Britain throughout the world by means of the screen. The enterprise is affiliated with the Famous Players-Lasky Corporation. Major Davies is also Chairman of the Picture Playhouses Limited, a company which has been formed with a capital of £1,000,000.

## INDUSTRIAL RESEARCH IN THE U. S.*

By J. C. Fields, Ph.D., F.R.S.

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In June, 1917, and in August and September, 1918, the writer visited centres in the United States where there were organizations for industrial research. The effects of the war in stimulating research were in evidence on both occasions. On the former visit these effects were manifested largely in attempts to supply pressing economic needs. When war first broke out the people of the United States were deprived of important articles which they had formerly imported from Europe. The research workers of the country were called on to devise means of producing either the articles themselves or effective substitutes. The results surpassed all expectations.

Synthetic drugs and chemicals, which were formerly derived from Germany, are now prepared in the United States. Certain high grade steel alloys, for which America looked to Austria, are now manufactured on this side of the Atlantic. The American dye-stuffs industry has been placed in a position where it can cheerfully meet all competition. In 1914 the United States produced less than $2,500,000 worth of artificial dyes. In 1917 the output was more than $57,000,000. The total annual production of the world before the war was $92,150,000, of which Germany's proportion was $68,300,000.

### Production of Potash.

The potash needs of the country are not as yet satisfied. Nevertheless in 1917 the product from various native sources totalled $14,000,000. Of this $8,000,000 worth came from the brine lakes of Nebraska and other States. The kelp of the Pacific Coast furnished $2,000,000 worth and $1,000,000

* With acknowledgments to the *University of Toronto Monthly*.

worth was provided by the molasses residue from distilleries. Only $750,000 worth came from the chimneys of cement factories. Dr. Van H. Manning, the Director of the Bureau of Mines, to whose kindness I am indebted for these figures, expects that ere long half the needs of the country will be supplied from the last named source. He is hopeful, too, that a considerable amount will ultimately be recovered from the dust from blast furnaces. Much valuable work has been done by the Bureau of Mines in connection with the two last mentioned sources of supply.

When I visited the United States in 1918, practically all the research laboratories were busied on war problems. The research men were working under pressure and in one laboratory I was told that they were doing in one month what in peace times it would have taken the greater part of a year to accomplish. The laboratories were not as accessible as they were on my visit of the year preceding, and where one saw something of what was being done it was understood that much of it was of a confidential character.

When the United States entered the war, the research workers in the Universities and elsewhere volunteered their services. The scientific forces of the country were mobilized with results which have been far reaching. The achievements of science in the war cannot but appeal to the popular imagination. When the ban of secrecy is completely lifted and it is realised how multifarious and how important these achievements have been public opinion will surely insist on a more generous support of research and a better treatment of the research worker, both inside and outside the University. The manufacturers, including the smaller ones, are becoming more and more impressed with the potentialities lying in the application of science to industry. I was told of a manufacturer of woodenware on a small scale who took up the construction of aeroplane parts and, in that connection, experienced the benefit of scientific advice. He stated that he had formerly had no faith in the scientist. He now realized, however, that many of his difficulties might have been solved for him ten years earlier had he been willing to consult a scientifically trained man. This instance was cited to me by a well-known chemist who also told me the story of a group of firms which had muddled over a problem until they had expended $100,000, without result. They then came to him and stated that they were ready to spend $100,000 more on the problem and that they were willing to wait five years for a solution. Three research men were put to work on it and the matter was speedily cleared up. The bill was $2,000. The results attained have proved of importance in the war.

One of the laboratories visited by the writer last August was that of the Eastman Kodak Company, located in Rochester, N.Y. This laboratory employs a staff of forty research workers and costs $150,000 for annual maintenance. When the United States declared war these research workers, together with certain others in the employ of the company, organized themselves into a teaching staff for instructing members of the air force in aerophotography. After a sufficient number of the latter had been trained so that they could do the teaching, the research workers returned to their laboratory and devoted themselves exclusively to war problems. Their services cost the country nothing, their salaries being paid by the company. The problems handled presented a considerable diversity in their nature. They concerned themselves, among other things, with anti-submarine devices, with liquid fuel and with aerophotographic apparatus. In particular, much time and ingenuity were expended in originating new types of color filter, that invention which plays such an important role in bringing out specific features

of a landscape as photographed from an aeroplane.

CO-OPERATION WITH UNIVERSITIES.

It may be noted that the Eastman Kodak Company is collaborating with the University of Illinois in manufacturing and selling at cost certain important chemical reagents. These reagents, which were formerly imported from Germany, are employed in chemical research.

Another large industry in Rochester is that of the Bausch and Lomb Company. The company employs nearly 6,000 workers and is the largest optical instrument company in America. Of its output 98 per cent, I was told, was for war purposes. Among its most important products are the rangefinders for the navy and anti-aircraft service. Some of those I saw were thirty feet in length. For the construction of rangefinders the very finest optical glass is essential. At the time of my visit to the United States in 1917 such glass was not to be had. In the meantime scientific men brought their skill and methods to bear on the matter and when I visited Rochester in 1918, a supply of optical glass was available which was equal to the best which had been imported from Germany before the war.

After leaving Rochester the writer visited Syracuse, Schenectady, Worscester and Boston. Near Syracuse is the laboratory of the Semet Solvay and the Solvay Process Companies. In this laboratory fifty research workers are employed. Much work has been done on processes for obtaining trinitrotoluol and on processes for producing benzalchloride and thence deriving benzaldehyde. A recent outcome of work done in this laboratory is a process for extracting potash salts from one of the larger brine lakes of California. They have also succeeded, in collaboration with Government chemists, in catalytically oxydizing ammonia for the manufacture on a commercial scale of nitric acid

The laboratory of the General Electric Company at Schenectady was visited by the writer both in 1917 and in 1918. During the past year, I have, on several occasions, given details in regard to some of the achievements of this great research establishment. Dr. Dushman, too, a member of the research staff at Schenectady and a graduate of our own University, has recently lectured here on the work of the laboratory. It may, therefore, suffice if I mention that in August last the laboratory was given over completely to war work, that the members of the staff were in particular preoccupied with the submarine problem and that the expenditure on research in 1918 was more than double that in the preceding year. It would probably be a safe guess to sap that the General Electric Company in 1918 expended on research in its various laboratories a sum which did not fall far short of $2,000,000.

CONDUCT DEPARTMENT ON COMMERCIAL BASIS.

At the Worcester polytechnic it struck one as rather novel to find that the Department of Mechanical Engineering was conducted on a commercial basis. The Department has its own shops, with a weekly pay list of $1,800. It possesses its own patents and manufactures apparatus for the market. In the year 1917-18 it did a business of $220,000. At the time of my visit 95 per cent of the output of the shops was war work. A student, I was told, could help pay his way by working in the shops.

A number of pieces of research which had engaged the attention of members of the staff were described to me. In that connection stress was laid on the necessity of collaboration on the part of the engineer with the physicist and the chemist, as in so many cases his problems bring him up against difficulties of a purely scientific character.

Another engineering institution is the Massachusetts Institute of Technology, which is now housed in its magnificent

new buildings on the Cambridge bank of the Charles River. The Institute conducts a course in physics and chemistry which is specially intended to train men for industrial research. It has extensive research laboratories, which at the time of my visit were being utilized for war purposes. It is also well-manned—a prerequisite in order that individual members of the staff may find time for research. A point which I noted was the emphasis which is laid on the calculus as an instrument for the engineer.

THE A. D. LITTLE LABORATORY.

Not far removed from the Institute of Technology, on the bank of the Charles River, stands the laboratory of the A. D. Little Company, Inc. This is a model commercial laboratory, employing forty research workers. One of its products is cellulose acetate, from which artificial silk, bristles and other articles are manufactured. A complete pulp and paper mill constitutes a part of the equipment. There is also a distillery, which is working on the extraction of alcohol from bananas. At the time of my visit war work was being carried on in the testing of foodstuffs on a large scale for the United States Government and the New England Food Administration. A study was also being made of varnishes for aeroplanes.

An interesting feature of Dr. Little's laboratory is an industrial research museum. This museum, which is still in its infancy, has as its purpose to exhibit the historic development of a variety of industries which depend on research for their growth. For example, the evolution of cottonseed oil and its by-products from cottonseed is illustrated. What was here dead waste forty years ago now means, thanks to the research worker, a product whose value to the United States for the year 1918 was $320,000,000.

Intermediate between Boston and New York I made a stay at Woods Hole, a Mecca for research biologists during the summer months. Here is located the Marine Biological Laboratory, on whose staff by the way are several good Canadians domiciled in the United States, including the Director, Professor Frank Lillie, of Chicago. Investigations were under way on a variety of subjects. In particular, a good deal of work was being done on problems connected with heredity. A touch of the war was in evidence in that the effect of poison gas on cell tissue was being studied. The war too was responsible for an attempt which was being made at a station of the U. S. Fish Commission in the vicinity to obtain a substitute for gum arabic from the kelp which is found along the coast.

In New York the writer met a number of scientists with whom he discussed industrial research. Among these was Dr. Takamine, the eminent Japanese chemist, who is responsible for the research movement in Japan. Dr. Takamine informed me that a sum of $5,000,000 (10,000,000 yen) was being raised to establish a research institute for physics and chemistry in Tokyo. The Emperor had subscribed $500,000, Parliament $1,000,000, commercial and industrial concerns $2,000,000, and it was expected that the remaining $1,500,000 would soon be in hand. The buildings are at present under construction. Members of the staff are now visiting other countries in search of the latest information, and will be on hand, prepared to assume their duties, as soon as the buildings are ready for occupation.

In its research undertakings the Japanese Government has been advised by Dr. Alcan Hirsch, of New York, who is also adviser to the Japan Dyestuffs Company, on whose capital of $4,000,000, the Government guarantees 8 per cent annually for ten years.

On the waterfront in New York are located the laboratories of the Western Electric Company. These are the greatest laboratories of their kind in the world, and Dr. F. B. Jewett, the Chief Engineer, on his recent visit to Toronto told us something of

their weird achievements in the realms of wireless and multiplex telephony and telegraphy and in long distance telephony. It is now possible to hold more than one telephone conversation and to transmit several telegraph messages simultaneously over the same wires without the slightest interference or confusion. It is also possible for a man standing on the ground and speaking in his ordinary tone of voice to give orders to aeroplanes at a distance of ten or fifteen miles. These, among others, are recent advances made in the laboratories over which Dr. Jewett presides. The research workers in these laboratories number more than three hundred and the Expenditure on research for the year 1918 was approximately $ 2,500,000.

At Wilmington, on the way from New York to Washington, are located the research headquartes of the Dupont Company. Here the annual expenditure on chemical research alone is $ 2,000,000. Besides this, a certain amount is expended on research in physics and engineering. There are four chemical laboratories, employing in all 290 research workers. Associated with each of these laboratories is an analytical division, whose chemists, make analyses and do other routine work for the research chemists, in order that the time of the latter may be spent to best advantage. There are also forty-four chemists who are experts on the different process in which the Dupont Companies are interested. All told, there are 1,100 chemists employed in various capacities in the works. The total number of employees is 65,000.

The bonus system has been introduced among the research workers and a bonus may run as high as $ 50,000. The policy of the Dupont Companies in this regard is somewhat in contrast with that of a large manufacturing concern, cited by Professor Stieglitz, of Chicago, which added a little over $ 200 a year to the salary of the Director of its research work for a device of his which netted the company a profit of $80,000, annually.

Another great research establishment whose upkeep for the year 1918 cost $ 2,000,000 is the Bureau of Standards maintained by the Federal Government in Washington, D. C. Besides the current expenditure just indicated $1,500,000 was being expended on new buildings. At the time of my visit there were 785 research men employed in the laboratories, besides which there were 75 men in the field. Of the 785 men here referred to, 300 had been detailed to do research work and were in uniform. I was told that about 600 problems a month were presented to the Bureau of Standards by the military services alone. Practically all the work of the Bureau last year had a bearing on the war. Of the problems handled 65 per cent were direct war problems. The remaining 35 per cent had an indirect bearing on the war.

Confidential reports were issued in bulletin form several times a month. These were sent to a limited number of persons, all of whom, with a few exceptions, were heads of military, naval or aeronautical departments or organizations. Each bulletin indicated in a general way the progress made on a number of problems.

The Bureau of Mines is also a federal institution whose activities are largely those of research. Its appropriation jumped from $1,250,000 in 1917 to $8,000,000 in 1918. Nearly all of the latter sum has been spent in connection with the gas warfare service. The Bureau had begun its investigations in connection with the gas warfare in February, 1917, that is to say, before the United States declared war. Its first investigations had to do with gas masks. These were later extended so as to include all sorts of materials and apparatus employed in gas warfare. It collaborated with the National Research Council, the universities and other bodies, as also with individuals. When in June, 1918, the Chemical Warfare Service of the National Army was formed, and the War Department took charge of the work which

the Bureau of mines had been doing in connection with gas warfare, the Bureau was able to turn over to the Department a complete organization, with a personnel numbering 1,800. This included a corps of 700 chemists.

The Bureau of Mines conducts investigations on metallurgical problems, on lignites, on the composition of coal and in its utilization. It studies, in fact, everything connected with mining. It has, for instance, done a great deal of experimental work on the flotation process for treating ores. It does work on the technology of petroleum and natural gas. The methods employed in obtaining oil have been very wasteful. For example, in Oklahoma oil has been obtained under circumstances which would mean a loss of $75,000 worth of natural fuel gas for $25,000 worth of oil recovered. In one field of Oklahoma, it has been estimated that the waste of fuel gas in one year was equivalent to $5,500,000 tons of coal. A very large proportion of this waste can be eliminated, as the Bureau of Mines has shown, by employing what is called the mud laden fluid method. A very large proportion of the oil, too, from 30 per cent to 90 per cent is left in the ground. It is able to cause the adoption of practices whereby the production is increased 10 per cent, the Bureau of Mines estimates that the ultimate aggregate saving to the country will be $450,000,000.

It would appear that the time is not so remote when the United States will have to look to its shales as a source of supply for oil. The Bureau of Mines has been studying processes for recovering oil from this source.

The Bureau of Mines has been instrumental in effecting a great saving in the by-products of coke. The United States had been wasting $50,000,000 a year by using the beehive oven instead of the by-product oven in the coking of coal. A great change due to the war, came about in 1917 during which year 22,600,000 tons of coke came from by-product ovens. This amount was greatly increased in 1918. During the latter year according to the Director of the Bureau of Mines the by-product ovens in operation were expected to produce 5,000,000 more tons of coke than if the coal had been coked by the beehive process. Furthermore he estimated that these ovens in full operation would produce 315,000,000 gallons of tar which could be used in the arts on which as a fuel would have the same efficiency as fuel oil. He also pointed out that they are capable of yielding 168,000,000 feet of gas or sufficient to melt 12,000,000 tons of steel in open-hearth furnaces. The by-products here in question have been of immense importance in the production of explosives for the war. They have made it possible too to establish the great American dyestuffs industry.

As a result of the war the American Government developed temporarily into the greatest manufacturer of chemicals in the world. Its appropriations for nitrate and sulphuric acid plants have run into the hundreds of millions. It has been suggested that the products of some of these plants be now utilized for the manufacture of fertilizers. In this connection one might remark that it has been stated on good authority that a reduction of the cost of soluble nitrogen compounds to a price comparable with that prevailing in Germany before the war would add $1,000,000,000 to the annual value of crops of the United States.

THE FERTILIZER QUESTION.

The National Research Council has interested itself in the fertilizer question. It is felt that the farmer should be taught to use fertilizer. In the past, however, the fertilizer companies have not always been fair to the farmer. They have sold him constituents which were in many cases superfluous for his land. To remedy this abuse, the National Research Council has, with the concurrence of the Fertilizers' Association, organized a commission of five scientific men who will

be paid by the Association. This commission, in co-operation with the individual States, will undertake a survey of lands in the Middle West with a view to determining the specific needs of the soils in different parts of that region.

It might be well to here say something more about the National Research Council, as it is an organization of comparatively recent date which has already abundantly justified its existence and which promises to exercise an immense influence on scientific and industrial research and on the intellectual life of the country in general.

"In April, 1916, immediately after the attack on the *Sussex*, the National Academy of Sciences voted to offer to the President its services in organizing the scientific resources of the country. This offer was accepted, and the Academy was requested to secure the co-operation of all agencies Governmental, Educational and Industrial, in which research facilities are available. The national Research Council, comprising the chiefs of the technical bureaus of the Army and Navy, the heads of Government bureaus engaged in scientific research, a group of investigators representing educational institutions and research foundations, and another group, including representatives of industrial and engineering research, was accordingly constituted by the Academy with the active co-operation of the leading national scientific and engineering societies. To these were added representatives of the Government designated by the President."

Early in 1917 the National Research Council was requested to act as the Department of Science and Research of the Council of National Defence. On May 11th, 1918, the President of the United States issued an executive order in which he commended the work of the National Research Council requested the National Academy of Sciences to perpetuate its organization. At the same time he specified its functions as follows:

(1) In general, to stimulate research in the mathematical, physical and biological sciences, and in the application of these sciences to engineering, agricultural, medicine and other useful arts, with the object of increasing knowledge, of strengthening the national defence and of contributing in other ways to the public welfare.

(2) To survey the larger possibilities of science, to formulate comprehensive projects of research, and to develop effective means of utilizing the scientific and technical resources of the country for dealing with these projects.

(3) To promote co-operation in research at home and abroad, in order to secure concentration of effort, minimize duplication, and stimulate progress; but in all co-operative undertakings to give encouragement to individual initiative, as fundamentally important to the advancement of science.

(4) To serve as a means of bringing American and foreign investigators into active co-operation with the scientific and technical services of the war and navy departments and with those of the civil branches of the Government.

(5) To direct the attention of scientific and technical investigators to the present importance of military and industrial problems in connection with the war, and to aid in the solution of these problems by organizing specific researches.

(6) To gather and collate scientific and technical information at home and abroad, in co-operation with Governmental and other agencies and to render such information available to duly accredited persons.

Under its war organization the National Research Council counted more than one hundred members. It had as officers a chairman, three vice-chairmen, a treasurer, an executive secretary, and two assistant secretaries. With these was associated an executive board. The Council worked through eight so-called *Divisions*. The chairmen and vice-chairmen of these divisions

were members of the Council. This, however, was not the case with the great marjority of the members of the Divisions.

The territories covered by the activities of the several Divisions are more or less vaguely suggested by their titles, as follows: (1) General Relations, (2) Military, (3) Engineering, (4) Physics, Mathematics, Astronomy and Geophysics, (5) Chemistry and Chemical Technology, (6) Geology and Geography, (7) Medicine and Related Sciences, (8) Agriculture, Botany, Forestry, Zoology, and Fisheries. Under Division (1) are included foreign relations, relations with educational institutions, industrial research, reconstruction problems, etc. Division (2) includes the Research Information Service. This service has branches attached to the embassies in London, Paris and Rome. The appointment of a scientific attaché to an embassy is an innovation for which the National Research Council is responsible. The departure has, however, been amply justified and the office is likely to be made a permanent institution. One of the functions of a scientific attaché is to keep headquarters at Washington informed on all scientific developments which take place in the country to which his embassy is accredited. Another is to place American army and navy officers in his vicinity in a position to obtain any scientific information which they may require.

The National Research Council has utilized workers in all branches of science. The laymen would hardly expect results of military value from an astronomer. Yet a remarkably expeditious method of reducing observations made in sound-ranging is due to a Princeton astronomer who has been working under auspices of the National Research Council Astronomers in the United States have also made important discoveries relating to the trajectories of projectiles and the dropping of bombs, and an American astronomer is said to have perfected a new instrument which will be of great use to navigators whether on the sea or in the air.

Another surprise for the layman is to be found in the effective war service rendered by the psychologists. At the suggestion of the National Research Council a psychological examination of the troops was undertaken. This proved a great success and sufficed in many cases to determine in advance that it would be impossible to fit a man for a given post.

Until the close of hostilities the activities of the National Research Council were almost wholly absorbed by matters relating directly to the war. It is now reorganizing and has already adopted a new constitution under which, among other changes, a modified classification of Divisions has been introduced. In the new arrangement the Divisions are grouped into two classes A and B. The Divisions in these classes are as follows:

A. Divisions of general relations: (1) Government Division. (2) Foreign Relations. (3) States Relations. (4) Educational Relations. (5) Industrial Relations. (6) Research Information Service.

B. Divisions of science and technology: (7) Physical Sciences. (8) Engineering. (9) Chemistry and Chemical Technology. (10) Geology and Geography. (11) Medical Sciences. (12) Biology and Agriculture. (13) Anthropology and Psychology.

We shall not here go into detail with regard to other changes in the Constitution of the Council. Its peace plans are not as yet completely defined. Whatever shape they may take, however, there is reason to believe that the necessary funds will be forthcoming from other than Government sources. Before the close of the war it was already planning an extensive campaign for the promotion of industrial research. In this it was to receive the support of some of the most prominent commercial and industrial men in the country as well as of men in the scientific and technological professions. On his visit to Toronto already referred to, Dr. F. B. Jewett informed us that the National Research Council is

now proposing that the leading universities found research professorships. He also told us something about the generous dimensions of the research fellowships which the council intends to establish the necessary funds thereto being furnished by corporations which have benefited by research. Last year the National Research Council received $122,000 from President Wilson out of the fund of $100,000,000 which was voted to him by Congress to dispose of as he deemed best for the national security and defence. Financial aid to the extent of $50,000 was furnished by the Rockefeller Institute and the Carnegie Corporation of New York contributed $100,000.

As a sign of the times it may be noted that one of the largest corporations in the United States has under consideration a project for establishing a graduate school in connection with its laboratories where selected students on fellowships would be trained in research methods and whence later on the brightest among them would be drafted into well-paid positions in the Company's research department.

It may be pointed out that at a meeting of representatives of National Academies held in the rooms of the Royal Society at London in October last it was proposed that each of the allied countries should have a National Research Council and it was further more suggested that there should be an international Research Council made up of representatives from the several National Research Councils. What would Canada's part be in such a scheme? Is Canada doing all that she should do in the matter of research? A prominent American scientist in conversation with the writer stated that Canada should be doing as much research as the United States actually is doing and that the United States should be doing ten times as much as she is doing. If this statement is correct Canada's multiplier would considerably in excess of ten.

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## THE GROWTH OF INDO-JAPANESE TRADE.

By Prof. Panchanandas Mukherji, M.A., F.R.E.S.,

*Presidency College, Calcutta.*

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THE practical cessation of our trade with the enemy countries—notably Germany and Austria—was taken full advantage of by our great Eastern ally Japan and by the United States of America—specially by the former.

If we go back to the year 1888-89, we find that imports from Japan were quite trifling "averaging less than three lakhs annually in the last five years." Since then, however, the trade with Japan has increased by leaps and bounds from Rs. 10'92 lakhs in 1903-4 to 15'16 lakhs in 1909-10, Rs. 27.47 lakhs in 1912-13, and 52 crores in 1917-18. Of countries outside the British Empire Japan held in 1917-18 the premier place in the import trade (imports from Japan amounting to over 18 crores) and the second place in the export trade (exports to Japan amounting to 34 crores) being surpassed only by the United States of America. We have it on the authority of Mr. F. Shirres, the Director of Statisties, that imports from Japan last year (1917-18) had increased by 400 per cent the pre-war quinquennial average, while exports to Japan had increased by 103 per cent.

The increased imports from Japan are attributable to many causes. Within recent times the Japanese have established commercial agencies in India; they have been enjoying the great advantage of a direct line of subsidized steamers and low freights to India and they have banking facilities arising out of the establishment of branches

of their banks in India. They have, moreover, studied the Indian market more carefully than the majority of the importing countries, specially in regard to cheap and showy articles for which there is a large demand in India. The goods are placed on the Indian market in a way in which they are required, and although of very inferior quality are extremely cheap and it is well known that cheap, showy goods, irrespective of usefulness or durability, have a great attraction for the poverty-stricken masses of the Indian people.

The following figures relating to Japanese Imports into India compiled from the "statistics relating to the Sea-borne Trade and Navigation of British India" will be found illuminating:

| Articles. | Year. | |
|---|---|---|
| | 1913-14 | 1916-17 |
| | Rs. | Rs. |
| Glass and Glassware ... | 15,81,299 | 89,81,595 |
| Matches ... | 39,06,824 | 90,59,528 |
| Twists and Yarn ... | 13,91,562 | 53,10,725 |
| Cotton Piecegoods. ... | 14,04,731 | 236,000,00 |
| Silk Piecegoods ... | 1,17,60,296 | 1,17,30,791 |
| Sugar ... | 28,755 | 41,04,672 |
| Hosiery ... | 83,37,979 | 1,27,45,326 |
| Hardware ... | 4,97,979 (in 1914-15) | 50,02,348 |
| Liquors ... | ... | 11,34.144 |
| Machinery and Mill-work ... | 1,54,834 (in 1914-15) | 13,33,144 |
| Apparel ... | 10,25,559 | 20,26,197 |

In regard to imports, it will be noted that in certain lines of the Japanese import trade such as cotton hosiery and piecegoods, silk, glass and glassware, matches, umbrella fittings, machinery and mill work, tyres and tubes, cement, toys, sugar, and liquors. Japan's position is yearly growing in importance. As compared with the pre-war year 1913-14, glassware increased by Rs. 74 lakhs, matches by 52 lakhs, hosiery and hardware (chiefly enamelled earthenware) by Rs. 44 lakhs each, sugar by nearly Rs. 41 lakhs, and cotton yarn by Rs. 39 lakhs. Other noticeable increases were in regard to chemicals, paper, woollen goods, wood, brass, stationery (including wooden bobbins for jute mills), earthenware and porcelain toy, beer, haberdashery, apparel, buttons, tea chests, and cement. The most surprising and humiliating fact as regards imports is that India, the greatest sugar-producing country, should import sugar and cotton piecegoods in enormous quantities from a country whose exports of those commodities but a few years ago, were of negligible value. Fancy, Japan which six years ago exported only Rs. 28,755 worth of sugar now exports sugar worth more than 41 lakhs, *i.e.*, the value of Japanese sugar imported into India was more than one hundred and forty times of what it was six years ago in 1913-14. Again, cotton piecegoods which formed the chief article of import in 1916-17 was valued at 243 lakhs in 1916-17, as against the pre-war quinquennial average of only six lakhs, *i.e.*, the value of imports of Japanese cotton piecegoods in 1916-17 was forty times of what it was in the pre-war quinquennium. If we look at the amount (in yards) of cloth imported from Japan we shall similarly realise the phenomenal character of this increase.

| Pre-war average | Grey untrached | White bleached | Colored printed or dyed |
|---|---|---|---|
| 1909-10—1913-14 | 2,559,000 | 48,000 | 5,21,000 |
| ... | 72,278,000 | 2,602,000 | 18,679,000 |

A still more surprising and humiliating fact is that the Japanese cotton piecegoods are manufactured out of Indian raw cotton exported to Japan; for, eversince 1911-12 Japan has been on an average imporing more than 17 crores worth of raw cotton and the cotton piecegoods woven out of it are being dumped on Indian and Chinese markets on an alarmingly increasing scale. The following extract from Mr. C. N. Wadia's speech at the recent annual meeting of the Bombay Millowners' Association will clearly explain the situation.

"At present owing to rebates, Japan can not only buy and carry away our cotton, but spin it and deliver it in China at no greater transport charges. Worse than this Japan has been able to bring back cloth woven from our cotton to Bombay and compete with our local mills in our local trade. Her increase of cloth importation into India in the last two years has reached the very high figure of 1,000 per cent. I am told on good authority that Japan has on orer no fewer than three millions spindles—that is doubling the number of spindles at present at work in Japan. The future, therefore, cannot be viewed with equanimity if Government allow unrestricted dumping by that enterprising competitor, whose mills are worked 22 hours per day and whose owners have no factory law to comply with, who pay neither Excise Duty, Super Tax nor excess Profits Tax. Our China trade will be wiped out in the next ten years for a certainty unless energetic measures are taken to obtain cheap transport and unless an Export Duty is placed upon Cotton countries outside the Empire."

The following figures relating to Indian Exports to Japan compiled from the "statistics relating to the Sea-borne Trade and Navigation of British India" will be found illuminating.

| | 1913-14 | 1916-17 |
|---|---|---|
| Rice not in the husk ... | 1,61,58,289 | 26,606 |
| Skins panned or dressed ... | 13,25,673 | 17,21,032 |
| Opium ... | 17,98,700 | 23,83,070 |
| Raw cotton ... | 19,40,13,343 | 24,22,97,431 |
| Raw jute ... | 16,48,013 | 11,90,163 |
| Gunny bags ... | 13,79,355 | 27,78,412 |

The growing volume of Indian exports to Japan is largely accounted for by increasing exports of skins, opium, raw cotton and jute and gunny bags. Unhusked rice which formed one of the chief items of Indian exports to Japan is now a negligible item; in 1912-13, about 3 crores worth of rice was exported to Japan but in 1916-17 only 26 thousand rupees worth of rice was exported. This decrease is as remarkable as the increase in the value of exports of skins, raw cotton and jute, and gunny bags. One of the inexplicable facts of Japanese imports is the increase in the value of opium imports. Is the opium habit growing in Japan? or has this any connection with the Chino-Japanese quarrels regarding the surreptitious distribution of opium in China by Japanese hawkers?

While gratefully acknowledging Japan's services during the war period in filling the economic vacuum caused by the enforced withdrawal of the enemy countries from the Indian market and by the neutral passivity of industrial India and thus reducing to some extent, the economic distress in India, one cannot contemplate with equanimity the prospect of India being converted into the perennial dumping ground of the shoddy industrialism of Japan. If, as foreshadowed in the latest British Budget, Imperial Preference is to be the accepted tariff policy of British India, the first duty of the Finance Minister should be to raise the tariff wall against Japanese imports—specially of sugar and cotton piecegoods and to impose export duties on rice, skins and raw cotton.

# WILL RAMIE CULTIVATION PAY IN INDIA?

BY H. A. CARTER, A. C. R. A.

IT is now stated in London that textile inventors in the United States of America, who have been studying the matter for some time have devised a means by which ramie or China grass fibre can be easily spun into a very satisfactory yarn on ordinary cotton spinning machinery. This is a thing which has, so far, been found to be impossible to accomplish. Ramie fibre, as is generally known, is a much longer fibre in the staple than cotton, hence the difficulty which has been experienced up to the present time in spinning it successfully on ordinary cotton machinery. As, however, in the month of April tbe writer was shown by a friend of his, Mr. John Davis, a textile machinist, of 6, Egerton Grove, off Stretford Road, Manchester, Lancashire, a sample of fibre other than ramie, one which is also longer in the staple than cotton, which he, Mr. Davis, has lately succeeded in spinning into a good well spun yarn on ordinary cotton machinery, and given a sample of this last named yarn, the writer believes that the report from America that it is now possible to spin ramie and China grass cheaply, and successfully, on cotton machinery is true, and its effect should be very beneficial on this industry, which, like the growth and manufacture of cotton, is so closely associated with the Indian Empire. Mr. Davis has only found it necessary to introduce slight alterations in the method of cotton spinning to get ordinary cotton machinery to spin the other fibre in which he is interested into good yarn, a sample of which, together with a specimen of the raw fibre from which the same was spun, a species of vegetable silk long in the staple, the writer has forwarded to the Editor of this *Journal*, and the same may practically be said in regard to the means said to have been devised in the United States for the spinning of ramie and China grass fibre in this manner according to the opinions expressed by experts here. Mr. Davis, for instance, considers it quite possible, and the difficulties which present themselves by no means unsurmountable. No doubt, the United States Government Bureau of Foreign and Domestic Commerce, Washington, D. C., U. S. A., will be able, if asked to do so, to place those interested in the matter in communication with the American inventors of this new method of spinning ramie.

If it now becomes possible to spin the fibre in the ordinary cotton mills of Europe, India, and the United States, and that with but little difficulty and expense, the world's consumption of ramie and China grass textiles should, and there is but little doubt will, increase considerably. The report further concerns the long fibres and not the "noils" or waste of ramie. Up to to-day it has been found that the machinery in cotton mills travels too fast to spin the fibres successfully, though an improvement is at once effected if the drawing rollers in this are placed farther apart from each other. At any rate, Mr. Davis has experienced but little difficulty in getting his long stapled vegetable silk to spin on this machinery which ordinarily travels fast. Ramie and China grass are the longest of all the textile fibres in the staple, the fibre is a long flat ribbon like one but just the fact of its length enables it to be spun into yarn without it being necessary to give it anything like so great a degree of twisting in the process as is absolutely necessary in the case of cotton, and all the shorter stapled fibres; in fact, it can be successfully spun with the very minimum of twist, therefore, if the torsional strength and elasticity possessed by ramie and China grass fibre are not quite so great as the torsional strength and elasticity possessed by cotton and flax, though some experts say that in

all well grown ramie they are, this does not militate against their easy and economical spinning into good, well spun, yarn. The much quoted Professor Julius Wiesner, of the Imperial School of Science, Vienna, is one of those fibre experts who declare (as the result of careful experiments carried out by him) that properly cultivated ramie, and China grass fibre is quite equal in these respects to the best qualities of flax, and it may be said, in passing, that he is much quoted as an absolute authority on fibre matters in the Encyclopedia Britannica.

This question as to the profit to be made by growing ramie in India, and, for that matter, in the British Colonies generally becomes, in view of these recent spinning inventions in the United States of America, one of increased interest and importance. Just before the War, Mr. Bernard Coventry, Inspector General of Agriculture for India, estimated the average crop of useful ramie fibre to be obtained in Indian cultivation, planting in the manner then followed, namely setting the plants at three feet distance from each other in the rows, and drawing the rows just three feet distance from each other, at one ton from each three acres cultivated, and the cost of cultivating at Rs. *313* for the three acres, which, he said, would show the planter a profit on his labour of £3 per acre if he obtained £ 30 per *ton for his fibre decorticated in the condition* of China grass, that is, having its outer skin or cuticle wholly removed, and this *work being done by machinery.* Since that time no doubt the wages demanded by the natives have increased but so also, it may be pointed out, has the *selling price of all* fibres, and that very considerably. While American Tully Middling cotton has been selling at 18·82 *d*, flax has been changing hands at much higher prices than this, and these enhanced values are certain to be maintained for a long time to come. Ramie and China grass have risen in price in sympathy, and may be quoted now at £85 per ton for China grass. Considering to-days cotton and flax quotations China grass should pay the manufacturer well to use at 9 pence to 10 pence per pound, and it is never likely in the future to be sold as cheaply as it has been in past times. The monopoly of the spinning of ramie yarn for incandescent gas mantle base making has now passed out of the hands of the Germans, and has become more a British industry. The new ramie factories of Messrs. Wm. Ross, Limited, Clonard Mills, Belfast, Ireland, are at present spinning eight to ten tons of ramie yarn weekly for this trade. Very much more ramie is now used on the continent to blend with natural silk in manufacturing than was formerly the case, and the fibre is much liked there, also, for railway carriage, and general upholsteries, for the upholstery trade chiefly in Germany. The last travelling train made for the ex-Kaiser is said to have been upholstered in ramie fibre. If the machinery in existing cotton mills can now be easily turned on to working ramie the uses to which the fibre can be put in combination with cotton are many. When used as a base for all waterproof and rubber goods ramie bears without sustaining injury the high temperature, which rots cotton when *it is employed for this purpose,* at which the rubber is vulcanised. Blendings of ramie, therefore, in cotton cloths used for this purpose would be beneficial and would produce a superior base cloth. Mr. W. Haworth, a well known Lancashire manufacturer, said some years ago speaking of the use of ramie with cotton, "Ramie would make warps of the finest cotton goods, while the wefts could be made of Sea Island or other fine cotton. It could be used for the finest materials up to the coarsest." Ramie is only two-thirds the weight of flax.

Hemp of any kind never gives satisfaction for ropes for driving machinery because of the harshness and unyielding nature of the fibre. Instead of the fibres expanding, and

contracting "en masse" when bending over pulleys the individual strands act independently of each other, and set up internal friction which wears away the rope from the centre. Cotton ropes are, therefore, used largely for driving machinery but although they are more pliable than hemp ropes, still, they are subject to the serious disadvantage of a high range of expansion and contraction under varying hydroscopical conditions at the atmosphere, and cotton being a short staple the fibres get broken on the surface of the rope, and the wear and tear is rapid. These demerits do not apply to ramie ropes the expansion and contraction of which, when dry or wet, is very little. They are very much stronger than cotton ropes, and less liable to wear owing to the staple being much longer, and to the homogeneous structure and smoothness of the fibre the ropes also yield much more rapidly to the shape of both pulley and groove; especially do these remarks apply to ramie retted by the "Rossi" microbiological process in which no chemicals whatever, are used. Even blends of ramie fibre, therefore, in cotton rope manufacture will improve the wearing qualities of the ropes in every way.

At present tbere is great need of novelty and innovation in printed cotton goods. Now if the weft of these be made from ramie fibre, and the warps from cotton, the ramie used being that which has been chemically degummed, and which is silky, a fine silk-like lustre shows up well on the cloth, and the colours and styles obtained upon the same when they are dyed or printed are the very best. The colours are deep, rich, and quite uniform, while patterns in printing stand out bright and clear. "Rossi's" microbiologically retted ramie does not, however, suit so well for this purpose as it resembles fine quality linen, and has but little silky lustre, which, in this particular case, is what is sought for, and which by making the goods silky imparts to them a most pleasing, attractive, and very novel appearance. By the use of this chemically degummed ramie fibre Dyers and Calico Printers could introduce quite a large description of speciality goods into these industries which the writer believes would meet with an extensive and very profitable sale. This should be particularly the case in India where, no doubt, as ramie is an Indian textile, patriotic motives would prompt the natives to purchase and use these Cotton-Ramie Union textiles. Ramie yarn, further, should be employed dyed in varying colours in cotton piecegoods to impart to them the coloured stripes which now are run along each side of these goods, and across their tops and bottoms at times,and for the small coloured figure effects so often met within cotton fabrics. If the ramie used is that which has been chemically degummed all these stripes and figure effects will show up quite silky. Ramie is the most hygienic of all textiles.

As in some localities the plant grows more luxuriantly than in others the distances between the plants to be observed in planting which will give the best results will suggest themselves to the planter after a little experience. If in consequence of overcrowding, or poorness of the soil the plants appear stunted and weak, then after having reaped the available shoots of the first crop transfer every other plant to fresh ground, and manure, and hoe the old land. Close planting, say 18 in. × 18 in. every way distance apart, seems the best method to follow at the outset, because, it goes without saying, that if the planter finds this method to be overcrowding, and the plants to be stunted—which, however, it must be remembered may not prove to be the case—it is, at the outset, much easier for him to rectify his error by then transferring every other plant to fresh ground than it will be for him, if he finds that he has set his plants at too great a distance apart from each other at the beginning, to go back then and set additional plants in the vacant spaces of land on his fields on which no growth of ramie has appeared. Should it

prove the case, at the outset, that his 18 in. × 18 in. apart planted fields yield him a large and satisfactory crop of useful fibre, straightaway, then he has planted his land on the correct method at the start, and he has nothing further to do in order to succeed than to pursue that method without any change. The plants require to be placed on raised ridges for though requiring and using a fair amount of water they are liable, (especially those of the temperate climate variety, *i.e.*, that which has the under surface of the leaf silvery white), to he injured if water is allowed to lodge at the roots. Thorough drainage is therefore essential. *The silvery* leaf ramie, *Bœhmeria nivea*, is said always to grow best in a temperate climate such as that of the Northern parts of China, while *B. tenacissima* the Ramie of Assam, and the Malay Archipelago, it is said, which has the leaves green on both sides, with whitish veins, is a tropical plant requiring a warm equable climate, moist atmosphere and fairly good rainfall. Under no conditions, however, must either of these varieties of the plant be given more than just a sufficiency of moisture in their growth. If they are given too much, too little, or both of these in any one season, the strength and other good qualities of the fibre are damaged. The correct quantity of moisture to supply to the plants will, like the distances between them, suggest itself to the planter after a little experience. Land selected to grow upon should always be above inundation level. This is very important, and all authorities seem to agree that the best soil is a rich, light, not too sandy, loam, somewhat shady at first. The subsoil must be good and porous so that superfluous moisture may be carried off. The plant will grow in strong alkali soils provided the alkali is not carbonate of soda because the ground is shaded, and the evaporation going on through the leaves of the plants instead of at the surface of the soil will not accumulate the noxious salts around the root crowns so as to corrode them.

The following analysis of the Ramie plant by Dr. T. K. Hornidge will indicate the description of plant food required. 100 parts of the ramie stalks contain :—

| | |
|---|---|
| Carbon ... | ... 47·28 |
| Hydrogen ... | ... 6·26 |
| Nitrogen ... | ... 0·09 |
| Oxygen ... | ... 42·23 |
| Ashes (or residue) ... | ... 4·14 |
| | 100·00 |

And in 100 parts of the Ashes (or Residue) :—

| | | |
|---|---|---|
| Carbonate of Potash ... | 32·37 | per cent } * |
| Do Soda ... | 16·39 | ,, } |
| Lime Carbonate (chalk) ... | 8·40 | ,, |
| Magnesia ... | 5·39 | ,, |
| Salts of Iron ... | ... | ,, |
| Common salt ... | 9·13 | ,, |
| Phosphoric Acid ... | 9·61 | ,, |
| Sulphuric Acid ... | 3·21 | ,, |
| Carbonic Acid ... | 8·90 | ,, |
| Silicic Acid and Sand ... | 6·60 | ,, |
| | 99·90 | per cent |

* or 48·76 Alkalies.

It is a fact that 1,600 pounds of useful ramie fibre have been got in the South of France in culture per acre, per annum, and 1,280 pounds at Padua, Italy, in a climate similar to that of the South of France. This is worth remembering when we consider the claim made by Mon Faure, of Limoges, Haute Vienne, France, that he gets equal to 4,480 pounds of useful ramie fibre per acre, per annum, from his field of rather more than one-third of an acre at Limoges, which the British Consul at Limoges, Mr. G. S. Boddy, says, after a recent visit to this field, he believes to be quite true. The Limoges yield is just 2,880 pounds per acre, per annum, more than the first yield named for the South of France in this article. The increase is considerable but the fact that 1,600 pounds has been earlier obtained goes far to prove that the size of the Limoges crop has not been overestimated, and to show what results may be obtained in the right soil and climate.

In a book published in London "Brazil in 1913" by T. C. Oakenfull, the author states

I. Another Variety of Thick Cane—Just being Experimented.

that one hectare ($2\frac{1}{2}$ acres) of land in Brazil should yield four crops of ramie yearly of 40 tons each = 160 tons, in all, at 16*s.* to 20*s.* per ton. This apparently refers to the green crop of stems and leaves, and means a production of 64 tons per acre, which at 5 per cent clean fibre yield would give about 2 tons of useful fibre per acre, per annum.

A climate resembling that of the South of France would, from all we know, seem to be the ideal climate in which to grow ramie, and various parts of the world possess this climate, India possibly included, the latter will be best known, in India! If it is the case, excellent crops should be got in these districts.

Some have suggested that ramie is somewhat lacking in power to withstand compression. All fibres are subject to compression when as yarn they are woven into cloth in the loom. This may, or it may not, be the case in connection with ramie. Careful tests of Rossi's microbiologically retted ramie, and of efficiently chemically degummed ramie such as that produced, for instance, by Le Societe Des Usines dé la Ramie Francaise, (P. A. Favieret Cie), 10, Rue d' Hanteville, Paris, by experts, in such manufactured condition, yarn or cloth, as is most suitable, alone will decide this point definitely but, here it may be observed, that Prof. Alfred Barker, M.Sc., of the University, Leeds, Eng. has recently devised a new power-loom, specially for the weaving of ramie, and artificial silk yarn which he says will put less compression upon these textiles, and humour them better, generally, than will even the hand loom. In the writer's opinion, however, as in that of Prof. Barker, all the defects which some alledge are possessed by ramie fibre to a greater or less degree are to be ascribed wholly, either to bad machine decortication, or bad chemical degumming, and not to any faults inherent in the "crude" ramie, or China grass fibre itself. Planters should experiment, on a small scale to commence, in the growth of ramie.

## THE SUGAR-CANE INDUSTRY— A LESSON FROM SOUTH ARCOT.

BY N. R. SUBBA AYYAR, M.A., L.T.

THE phenomenally large imports of Java sugar into this country and the high retail prices now prevailing in the market have tended to focus our attention on the improvement of the sugar-cane industry of India. Again, the constantly increasing consumption of sugar in all countries of the world and the complete cessation of the imports of beet-root sugar from Germany and Austria have given an impetus to the Indian industry. And, therefore, the question is being freely discussed if India can take advantage of this opportunity and grow sufficient sugar-cane to meet the needs of home consumption and also become an exporting country as she once was. The news of the appointment of a strong Commission of sugar-cane experts with Mr. Mckenna as chairman to explore the possibilities of the Indian sugar Industry is, therefore, to be hailed with delight and we doubt not that the labours of this Commission would result in placing this very important Indian industry on a secure footing.

The difficulties that have till now stood in the way of any large extension or improvements in the sugar-cane industry of this country are chiefly four in number, *i. e.*, the poor character of the canes grown, the very small holdings on which the crop is cultivated, in sufficient water-supply, and inferior methods of extracting sugar. It is the aim of this article to show how these difficulties have been largely overcome in the South Arcot District of the Madras Presidency where a large up-to-date factory has been successfully working for the past two decades.

At one time, and that not long ago, a thin whitish cane was the only one grown

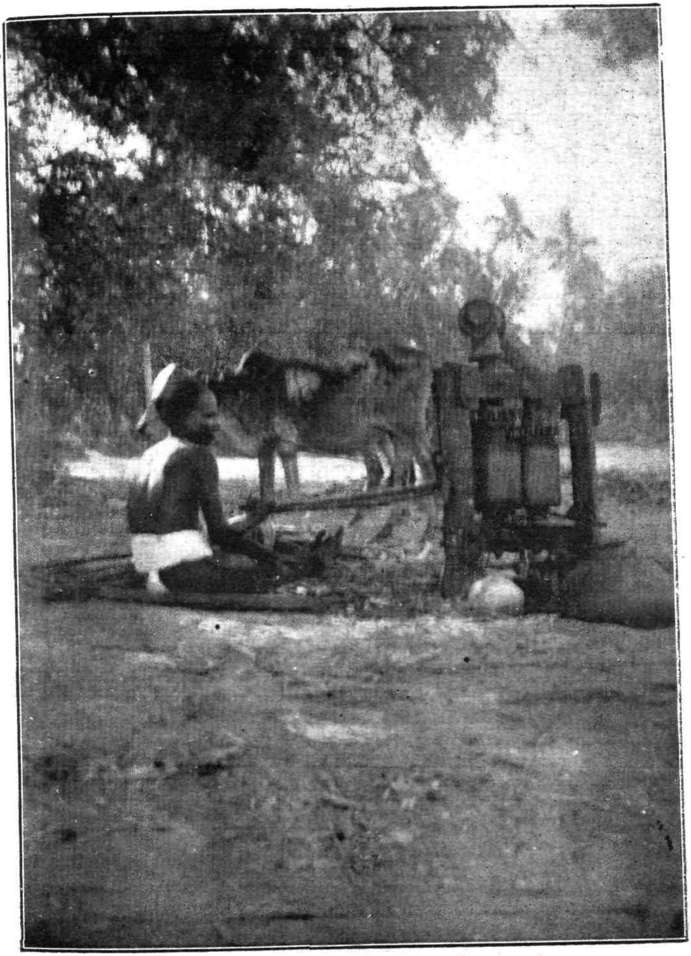
by the ryots in this district. It was a poor variety and easily ravaged by jackals and other animals. But thanks to the unremitting efforts of the Madras Agricultural Department these ryots fully appreciated the advantages of growing a thicker and better class of cane, the value of which had been demonstrated to them by Government Agricultural Farm at Palur. In a few years the cultivation of the poor indigenous variety was completely given up, and in its place the Red Mauritius cane was grown. To-day it is impossible to see any tract round the Nellikuppam Factory growing the old cane. The Red Mauritius is the favourite of the ryots. Better varieties are being grown experimentally, but the ryots have not been induced to take to their cultivation on a large scale with any great enthusiasm. They are perfectly satisfied with the thick Red Mauritius. Thus we see that the Indian ryot is not after all so hopelessly conservative. He evidently understands his business and is not slow to give up his traditional ways if only one is satisfied with the results of new experiments and improvements in agriculture.

The sub-division of land in India is another real difficulty in the way of large agricultural improvements. The holdings of the ordinary ryots are so small and scattered that the use of up-to-date machinery is not possible on a large scale. When a tract of agricultural land is fairly large and compact, irrigation from wells by Oil Engine Pumps, and ploughing by Motor-driven machinery can be successfully undertaken. In the case of sugar-cane, carting charges to the factory can be reduced to a minimum if the cultivated area is large and near the factory. So small holdings should give place to large ones if the sugar-cane industry is to be extended and improved.

This great difficulty of small holdings has been successfully overcome in the South Arcot District by the factory taking over all the small holdings in a certain area on a ten year lease or even a fifteen year one. The whole tract thus acquired by lease is levelled and put under motor-driven ploughs. Manuring, irrigation and general superintendence are thus renderd easy, and the strain on the ryots' cattle in ploughing and in lifting water for the crop is, therefore, considerably reduced, while the canes are easily and regularly carted to the central factory. When the lease is about to expire, the ryots are given the option to take back their holdings or lease them again to the factory. In the former case the land is again subdivided and plotted and the boundary carefully marked and the holdings handed over to the owners.

This system seems to us to be a very successful solution of the problem of small holdings in India. The very fact that the ryots are willing to lease their holdings again shows that in their opinion the transaction or the contract with the factory is on the whole advantageous to them. It should therefore be possible for a co-operative concern to take on lease the small holdings of the ryots in other places and employ modern agricultural machinery in the cultivation of sugar-cane.

The next difficulty which the sugar-cane cultivator has to face is insufficient water-supply. But where large stores of subterranean water are available, Oil Engine Pumps can be easily erected at convenient distances in a sugar-cane tract, so as to ensure a regular and constant water-supply. At Nellikuppam and the surrounding areas, the use of oil engines for pumping water to sugar-cane fields is a common feature. The soil being workable, the construction of wells in this part of the District has presented no difficulties; and six to ten acres of land are being easily irrigated in a day by one of these small engines. The fear of failure of water-supply has been thus reduced to a minimum; and the expenditure too on the



II. A Three Roller Iron Mill (S. Arcot.)

sinking of the wells and the putting up of the engine pumps is more than compensated by the unusually good crop.

Lastly we come to the inferior methods of extracting sugar. At present a large number of ryots are using the three Roller Iron Mills which are worked by a pair of cattle as shown in the illustration. These are no doubt an improvement on the old wooden mills, but are still unsatisfactory inasmuch as a large percentage of cane juice is left unexpressed. This is a clear waste which can be avoided only by the use of power-driven mills. "Each of these at Pre-war prices cost about Rs. 12,000, and is capable of dealing with 100 acres of good cane in a season. Roughly of the sugar consumed in India, three-fourths is grown in the country and one-fourth is imported. Roughly also, of that grown in the country one-third is wasted owing to the inefficiency of the primitive methods of extraction. Nearly one-half of this loss might easily be avoided, and if it were, the profits of cane cultivation would be greatly increased." (Report of the Indian Industrial Commission.)

In South Arcot there are two powerful steam mills which together crush all the sugar-cane grown in the eastern cane-tract of the district. The increase in the yield of sugar and the quality of the juice expressed have already opened the eyes of the Indian ryots, but want of capital stares them in the face. A rich Indian farmer with commendable enterprise installed on his estate in this District a small power-driven plant which, however, is not a growing concern to-day, chiefly because of the great factory at Nellikuppam.

But this failure should not be considered seriously. There is no doubt that the use of power-driven machinery in the extraction of cane-juice and in the making of sugar will increase the yield by at least ten per cent. The success of the large factory at Nellikuppam in recent years should once for all dispel any doubt about the future of this industry, provided that modern machinery is employed. The Industries Commission say in their report "The universal adoption of power plants for cane crushing would cost about thirty crores of rupees: this expenditure would be justified by the consequent reduction of the present cost of cane-crushing and by the increased yield of sugar. The indirect gains to agriculture would also be of the highest importance. Large numbers of cattle, whose work must be equivalent to many hundreds of thousands, probably millions, of horse power, are employed in lifting water and crushing cane. It is hardly realised how heavy is the burden thus entailed upon the farmer's cattle and how severe the resulting deterioration of their working power for purposes of cultivation"

The Indian sugar-cane Industry has, therefore, a great future if the improvements suggested above can be speedily effected. Here is a great field for Co-operative work being immediately undertaken under the auspices of the Government.

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One of the noteworthy consequences of the war, according to *Metall und Erz*, is the great increase in the output of wolfram. Before the war the whole world-production did not exceed 10,000 tons annually. The present output is at least double that quantity. An approximate estimate gives: Portugal, Spain, France, and Great Britain, 2,500 to 2,800 tons; North America, 6,000 tons; South America, 3,000 to 3,500 tons; India, Siam, the Malay States, and Australia, 5,500 to 6,000 tons; China and Japan, with Indo-China, 800 to 1,200 tons. The stimulus has been high prices, so that a drop in market value would close some of the mines. Russia certainly possesses deposits of wolfram. South America, Spain, and some countries favourable to Germany may be expected to ship to her wolfram ore at prices considerably below the present abnormally high level.

## CO-OPERATION IN MYSORE, 1917-18.

By "Rusticus."

THE days are now past when converts to co-operation, as to Christianity in early days, come in their legions. It is just as well for many of them bore the burden of the new faith very lightly and were a source of weakness rather than of strength. Mysore is no exception to the rule which has been general throughout India that progress in the future must be slower and more sure than it has been in the past. In 1917-18, the number of societies increased from 974 to 1,097 or by 12.6 per cent, their membership from 74,906 to 81,168 or by 9 per cent and the working capital from Rs. 57½ lakhs to Rs. 65 lakhs or by 13 per cent. This rate of expansion is sufficiently rapid. It is satisfactory to see that the staff of the Department, both superior and subordinate, is being increased. The Deputy Registrar is to be replaced by two Assistant Registrars. There is to be a third eventually when the agricultural and industrial side of co-operation has developed. We are inclined to think that it might have been better policy to appoint him at once in order to organize this side of the movement. The staff of inspectors and clerks have been considerably strengthened and will now expand automatically with the increase in societies.

The report contains many interesting statistics but it does not give the figures, which our readers will have gathered from previous articles in these series we regard as the acid "acid test" (to use a phrase which is now very much in fashion) of the soundness of the movement—those showing the percentage of the loans made by central banks or primary societies which is overdue. Such information as is given on this head entirely bears out the view of the Government of Mysore that the outstandings are heavy in all districts and that there is need for the adoption of special measures for recovering the arrears and enforcing punctually in repayment. We trust that the omission will be rectified in future Reports.

The measures taken during the year to improve the working of unsatisfactory societies, which consisted in the expulsion of delinquent members, the filing of suits against confirmed defaulters, and, generally of waking of the committees of management to a sense of their duties appear to have been distinctly effective judging from the changes in the classification of the societies. In the previous year, 401 societies were considered good, 327 fair, and 132 bad. In 1917-18, 593 were classified as good, 240 as fair and 124 as bad. These figures would convey more information if some idea were given of the conditions a society is required to satisfy before it is placed in the "good" or "very good" class. At present the outsider has no means of judging whether the standard is a high one or not.

There is little in the working of central institutions or of primary societies for purposes of credit which calls for comment. We regret to see that no progress was made in regard to the amalgamation of the Bangalore Central Co-operative Bank and the Mysore Provincial Co-operative Bank into a State Co-operative Bank. The Shimoga District now shares with the Mysore District the distinction of having a District Central Bank. The Registrar Mr. Ranga Rao is not very hopeful of the future of the Federal Banking Unions. He points out that the sphere of their operations is either too large or too small. It is too large in that they are not in sufficiently close touch with their clientele as are primary societies and it is too small as operations which cover only a single *taluk* prevent them from being really effective banking institutions. The advantages they undoubtedely possess in the matter of supervision have so far been nullified by the difficulty in procuring competent Supervisors

on the meagre pay which is all they can afford. Mr. Ranga Rao therefore recommends that the more promising of them should be converted into District Banks.

As for societies for purposes other than credit the Mysore Co-operative Department like that of Bengal is paying special attention to weavers societies. There are now twenty-six of these and their transactions are by no means negligible, their purchases of yarn and other goods amounting in 1917-18 to Rs. 2.90 lakhs and their sales to Rs. 3'06 lakhs. It is very uphill work doing anything for weavers owing to their ignorance, illiteracy and general backwardness. Societies have now been started not only to provide them with credit but also to supply them with yarn, looms, dyes and other necessities for their work and to find them a market for the produce of their looms. That the Government of Mysore regard work amongst this class of the population with special sympathy is shown by the fact that they have recently sanctioned a special loan of Rs. 50,000 to the Weavers Co-operative Society in Bangalore to enable it to tide over the difficulties arising from the instability of the cloth and yarn market.

Of the ten societies for jaggary manufacturing and rice hulling, three of the jaggary societies worked for part of the year and one rice hulling society was engaged in putting up its plant. None of the other societies showed any signs of activity. The Registrar says that the working of the societies is still in the experimental state but if no work at all is being done, it is difficult to see in what the experiment consists. Surely it is time these societies were galvanized into life or wound up. Of the two lift irrigation societies one has paid back the loan of Rs. 3,000 due to the Industrial Department on account of the machinery purchased on its behalf and is now, therefore, firmly established. The other is waiting to buy its machinery under peace conditions and in the meantime is doing ordinary credit work.

We are especially glad to see that the number of societies for the depressed classes increased from seven to sixteen and that many of the existing societies are admitting persons belonging to these classes to their membership. There is no worthier field for co-operative activity than in improving the condition of these classes.

In our opinion the most interesting feature of the Report is the all too brief paragraph summarising the results of the investigation into the economic conditions of the members of co-operative societies. These results are so important that we need offer no apology for dealing with them at some length. In 1916-17, an investigation of a rather rough and ready order which extended to about fifty societies showed "that the indebtedness of the members had not decreased, that the grip of the sowcar on the ryot had not been appreciably relaxed and that, beyond conferring some little benefits, co-operative societies had not materially improved the economic conditions of their members." The survey carried out in 1917-18 was on a much larger scale. It covered 180 societies, the operations of which extended from 700 to 750 villages with about 1,00,000, houses the total population of the villages was about 5,00,000 of whom 13,200 were members of co-operative societies. Of these 5,000 had no debts of any kind when they joined their societies and have incurred none since. They were left out of the investigation. The proportion of members of the societies who were not in debt is suprisingly high and it would seem either that the societies whose operations came under investigation were particularly successful in attracting the best elements of the rural population or that the Indian ryot is more thrifty than he is usually given credit for. The indebtedness of the remaining 8,200 members at the time they joined their

societies amounted to Rs. 20,21,400 and their assets to Rs. 91,32,000. Their total indebtedness at the time of the investigation was Rs. 21,97,000 of which Rs. 10,50,000 were due to their societies and Rs. 11,47,000 to money lenders. Their total indebtedness had thus increased by about $1\frac{3}{4}$ lakhs but their total assets had increased by nearly Rs. 16 lakhs to Rs. 10,713,000. The Registrar considers these figures not unsatisfactory. He lays stress upon the fact that, although the amount of the indebtedness of the persons examined remained practically the same, the conditions attaching to that indebtedness altered materially for the better. Nearly half the money due to the money lenders had been paid up and in place of the high interest and onerous conditions to which that debt was subject, a reasonable rate of interest and easy conditions of repayment were substituted. The men were also put in position of the means of carrying on their agricultural operations and increased their assets by Rs. 16 lakhs. For our own part, we consider the figures disappointing. The first object of co-operation is the reduction of indebtedness and the promotion of thrift and it is very disconcerting to find that indebtedness has actually increased and that, even now, the members of Co-operative Societies owe more to the money lenders than to their societies. On the credit side has to be placed the increase in the assets but we attach much less importance to this than to the figures of indebtedness for the reason that the valuation of assets is a much more difficult matter than the ascertainment of debt. We should have been glad to have been told on what principles it was carried out. Has the rise in prices in the last few years been taken into consideration? Were the assets of the members on joining their societies valued at the prices then prevailing or at the present level? If the former, the rise in prices in recent years is more than sufficient to account for the increase. Again, it would have been interesting to know whether and, if so, what proportion of the members of the societies had entirely released themselves from their obligations to money lenders and how many of them still owed something to their societies and something to the sowcar. Has the sowcar made the terms for that part of the debt due to him more onerous? Endless questions of this character on which the economic enquirer would like light thrown could be asked. We trust that the results of the survey which it is proposed to complete for all the societies in the State will be published separately and that full details will be given of the manner in which it was carried out and of the qualifications of those to whom it was entrusted. If economic enquiries of this character are to yield information of real value, it is necessary that they should be carried out by trained men who are given careful instructions what to ask and how to ask it. Dr. Slater's enquiries in South India, Dr. Mann's in the Deccan and Mr. Jack's in the Faridpur District of Bengal are models of what such enquiries should be. But, notwithstanding the scantiness of our knowledge of the methods of the Mysore enquiry, we consider the results important and enlightening for it is obvious that if the investigators had any bias, it was in favour of co-operation. They have established that it has accomplished by no means as much as might have been expected and that Co-operators must apply their shoulders to the wheel of the Co-operation coach with redoubled energy, more especially in regard to freeing the members of societies from old debts. In this connexion, it is worthy of mention that the loans granted in 1917-18 for discharging prior debts amounted to Rs. 19 lakhs against Rs. 16 in the previous year.

Co-operation with special reference to agricultural and industrial development has yet to make a real beginning in Mysore. There are undoubtedly difficulties in the way. We do not know whether there are any

which are special to Mysore but from the Registrar's statement that he has suggested co-ordination of the efforts of the Department of Agriculture, the Department of Industries and Commerce, the Economic Conference, and the Co-operative Department, it would seem that one great difficulty is that too many departments are concerned. Societies have now, however, been started for the supply of seed, of manure and of implements as well as societies for artizans of different kinds so that in the next Report, there should be some substantial progress to record.

It only remains to add that the Government Review of the Report is full of helpful and stimulating criticism which in itself is evidence of that keen interest displayed by the highest authorities of the State in the welfare of the movement which is mentioned by the Registrar in the body of the Report and augurs well for the future of Co-operation in Mysore.

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According to a letter formulated by the World Trade Club advocating universal adoption of the metric system, the present coinage of the British Isles, as well as the weights and measures of both the British Isles and of America, is German. The British pound, both sterling and avoirdupois, originated with the old German Osterling Hanseatic League, which for hundreds of years controlled the trade of England. What is still more remarkable is that America and Britannia continue to use these old German tools after Germany herself has forgotton them. The latter country adopted in 1871 the simplest decimal system of quantity expression known—the application of the decimal to weights and measures, the invention of that truly great Briton, James Watt, in 1783.

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## THE PERIYAR IRRIGATION SCHEME.

By Prof. Albert J. Saunders, M.A., F.R. Econ. S.,

*American College, Madura.*

It is reported of the Great Alexander that he wept when he thought that there were no more countries which he could conquer. The world war of 1914-18 has ended, and we all hope that before long a lasting and just peace may be secured for the world. But peace no less than war will bring with it tremendous problems and responsibilities of reconstruction. There are still other worlds to conquer, as the air, water, and, a greater production from the soil. One has only to read the leading Economic Journals, and publications like *The Times Trade Supplement* to realise the difficulties involved and to learn of some of the suggestions already made to meet the needs of this new era. There is one thing about which all are agreed, and that is the great need for increased production throughout the world.

I

India will have a part—and a large part,—to play in meeting the urgent demands of an impoverished world, not only in agriculture, but also in manufactures. Next to capital, India's greatest need for industrial development is the question of power. We have often heard and read the relative advantages and disadvantages of steam-power and water-power as they relate in India, and it is a question of vital importance to Indian industry. The general opinion of those who have given much thought to this matter is that India can have and must have an industry driven by water-power. Referring to the industrial development in India, in the course of a recent address to the members of the Eighty Club, Mr. Alfred Dickinson, the

well-known Engineer, who was responsible for carrying out the huge works and dams for supplying Bombay with electricity, pointed out that the price of coal, not only in India, but throughout the world, was rising faster than the interest on capital was rising. Therefore, the disparity in the capital cost between water-power and a steam-power development was rather tending in favour of water-power. Cheap water-power for India, Mr. Dickinson said, was no idle dream. Messrs. Tata, of Bombay had been the pioneers, and recent investigations made were of the highest importance to the whole of the East. It had been discovered, for instance, that by constructing a dam across the valley in the Western Ghats, water could be harnessed so as to provide 300,000 horse-power every hour in the year. Mr. Joyner, who has been associated with the Tata Hydro-electric works since their inception says, "We can produce enormous quantities of water-power and not only that but the water giving such power will increase the food supply, ensure the growth of materials for industrial products, provide the fertilizers and the light, reduce the possibilities of famine, and allow the populations to be less dependent upon agriculture and the uncertainties and so help the general ease and contentment of the country." Some of my readers will also remember the interesting suggestions in this connection made by Prof. H. Stanley Jevons of Allahabad in reference to utilising the waters of the Ganges system in North India.

To show the importance which is being attached to the question of utilising water-power, especially in the British Empire, I may refer to the report recently issued by the Water-power Committee of the Conjoint Board of Scientific Inventions. This body was appointed to ascertain the possibilities and distribution of water-power in the British Empire, and to report on what is at present being done and what may be done in the future. It has recently issued its first report, and its conclusions are very important and interesting.

Among other things, the report has said that—according to its calculations the power at present being used throughout the world is 120 million horse-power. Of this amount, 75 million horse-power is used for factories and of the 75 million, the United Kingdom claims 13 millions, Continental Europe 24 millions, the United States, 29 millions, the British Dominions and Dependencies, 6 millions, and Asia and South America, 3 millions. Between 15 and 16 millions of the world's industrial horse-power, is at present developed from hydraulic resources, and here the United Kingdom is the most backward of all the countries, listed, with the exception of Russia, its 8·3 per cent comparing very unfavourably with the 43·3 per cent of Germany. The Committee estimate that the potential water-power of the Empire amounts to at least 50 to 70 million horse-power and they believe that much of this is capable of immediate economic development. They suggest that the development of such enormous possibilities should not be left to chance, but should be carried out under the guidance of some competent authority. They further propose that the Government should take steps to form an Imperial Board of Commission to include representatives of all the Dominions and Dependencies to investigate the matter, and advise the State as to developments which it might assist or initiate. It is unnecessary to point out the direct interest that India has in this question. Probably in no part of the British Empire, excepting perhaps, Canada, are the potential water resources more extensive and promising. In this very connection it is interesting to know that the Government of India have already appointed a committee to undertake preliminary investigations with a view to starting a systematic survey of water-power resources in India for the purpose of aiding industrial development.

As in the past, so in the future, as far as the British Commonwealth is concerned—

*The future belongs to Water.*

II.

THE PERIYAR WATER-SCHEME.

I wish to tell briefly the story of the Great South Indian Periyar Water-scheme. Over fifty years ago, Engineers in the Madras Presidency were observed with the idea of the possibility of catching and storing water in the Travancore Hills, and by means of channels and through the action of gravitation to distribute that water to the hot and thirsty plains of the Madura District. Investigations were undertaken, several experts made tests and trials, the scheme was pronounced feasible by the best advice obtainable, and then plans were drawn up and negotiations entered into for the prosecution of the work. The first great difficulty was obtaining sanction from the Government of Travancore (a Native State) to proceed with the scheme. The proposal was in past, to rob and direct a large water-supply in a Native State to feed and irrigate a district in British India. The Periyar River fed by many other smaller streams flowed westward from the hills for a distance of about sixty miles to the sea, and irrigated sections of Travancore lands on its way. It was not a large scheme; it was simply natural irrigation from a mountain stream; the Government had put very little money into the concern, and so its retention was not a great benefit and an absolute necessity to a great population of people, nor, on the other hand, would the diversion of the water be unspeakable hardship to the people concerned. It was the simple question of utilising to the greatest good the water available—the greatest good to the greatest nnmber. The old Travancore scheme was a small affair, benefiting a comparatively few people. The new Madras Government scheme would involve lakhs of rupees, it would store and utilise millions of tons of water, and give benefit to thousands upon thousands of needy people. The Government of Travancore were unwilling for some time to grant permission to this deviation of its water-supply. But at last they did the magnanimous thing, and allowed the Travancore Periyar water-supply to be diverted for the greater benefit of ryots in British India. The works designed and executed under the direction of Colonel John Pennycuick of the Royal Engineers and afterwards Chief Engineer of the Public Works Department during the administration of Barons-Connemara (1886), and Wenlock (1891), Governors of Madras.

The Travancore Hills where the Periyar Lake is situated lie to the South of the Palni Hills, and just on the border between the State of Travancore and the District of Madura in South India. There is a wide and well-kept ghat road from the Cumbam Valley over the hills, which runs close by the outlet of the lake. The journey up the ghat road to Tekkadi (altitude about 3,000 feet)—the outlet of Periyar, is very interesting. As we neared the summit of the hills, the road led us over a wild, rushing, mountain torrent. The water here comes down in thousands upon thousands of tons. It was the Periyar let loose with miles of water behind giving it an irresistable momentum. The sight was one of the most beautiful I have ever seen—falling water in its wildest ecstasy, with the voice of thunder, tremendous power, but wasted energy. From an Engineer's point of view,—it was a sad waste of potential power which migbt be utilised to generate electricity, supplying light and energy to a score of large towns, and enabling the city of Madura to become a great indnstrial centre. The water from the lake passes through a tunnel cut through a mountain one and one-eighth miles in length. We went to see where the water rushes out the mountain's side. The tunnel is 13½ by 7 feet, from which issues a great body of water, and as it leaves the weir, which is constructed just before the tunnel,

measures seventy feet by two feet of water per second. That water flows down to the hot and thirsty plains and irrigates thousands of square miles of land, enabling the desert place to become an oasis of life and plenty. It is just there at the weir that a large water wheel or turbine might be set up to translate that water-power into electrical energy, which then could easily be distributed to a number of centres within a radius of one hundred miles. This is no idle dream; it is within the realm of possibility. In fact such a scheme has already been projected. Madura which is only about fifty miles distant as the current line would go, needs electric light, city tramways, and a supply of power for its factories. These could easily be furnished if the necessary electricity were generated by utilising the water-power of the Periyar Channel, which is now going absolutely to waste. 1919 was the year when a projected scheme for doing this very thing was to be put into operation. But unfortunately and like so many other important works, the great war came and this proposal has had to be abandoned, at least for the present. We sincerely hope, however, that it will not be many years before the Project will again be received and completed.

At Tekhadi is the outlet end of the Periyar Lake. The lake itself is twenty-one miles long, and is fed by seven rivers—the largest and most important of which is the Periyar. The source of these rivers is forty miles from the head of the lake. While the total area of catchment is estimated at 232·801 square miles. Fourteen miles from the head of the lake, and therefore seven miles from its outlet end, is situated the Dam, which is a huge stone and concrete wall built across a valley and uniting two hills and making possible the large storage lake. The dam is 1,200 feet in length, 158 feet high, width at the base 85 feet, and at the top 12 feet. The lake when full, which is usually about the beginning of December, after the rainy season, registers 152 feet of water at the dam. When the water sinks to 132 feet the gates at the Head Sluice are closed, and distribution is stopped. So, there is therefore a thirty feet available supply of water from a lake twenty-one miles long by varying widths according to the arms of the lake. Should the water rise above 152 feet the flood-gates are opened and the water is allowed to escape through Travancore to the sea. The huge shutters are Stoney's Potent, and consist of ten spans. These are erected across a smaller valley a short distance from the dam. As I saw them in the light of the setting sun they were most picturesque, and, of course, far more interesting than the dam itself. The dam is leaking in several places, but nothing to cause any great alarm. The leaks are worse when the lake is full, and one cannot wonder much at that when he thinks of the tremendous pressure of those miles of water which the dam has to bear. Great care, however, is taken to watch those leaks. Tests are taken every month and sent to the Government Chemist in Madras for analysis. Two samples of water are taken one from the river water at the head of the lake, the other from the leak in the dam, and the test consists in seeing whether there is much lime in the one as compared with the other. If there is very little lime it shows that the leak is not serious, but if a large quantity of lime is coming through, then it means that the dam is being saturated, and the leak may soon become dangerous.

The dam took seven years to construct. The water scheme was opened in 1895. The water flows to the plains for nine months in the year, from June until March, and irrigates lands for a distance of 130 miles. The Periyar is the largest reservoir water scheme in India, and the capital outlay was over £ 700,000, or over 105 lakhs of rupees. There was no great engineering difficulty to overcome in this undertaking. It was simply the construction of a huge dam to connect two hills, and thus make a

eservoir capable of storing a great quantity f water. The altitude of the lake and the orce of gravitation made the distribution of he water a simple matter. To help in this listribution large tanks or lagoons are ituated all over the district, these are fed by he Periyar channel, and from them the vater flows through smaller channels again o the rice fields. Many fields now produce three crops a year, where formerly scarcely one was possible. The fertility of large sections of land in the Madura District has been enormously increased by this scheme.

III.

The accompanying statements will show the statistics of the scheme clearly.

## THE PERIYAR SYSTEM.

Statement showing the financial results of the Periyar Irrigation works for four years from 1912-13 to 1915-16, in rupees.

| Name of works. | Year | Mileage in operation | | Estimated cost of construction (direct and indirect) | Date of construction of work (P. W. Code II 1918) | Date when system came into operation | Total capital outlay (direct and indirect) | Accumulated arrears of interest | Accumulated surplus Revenues |
|---|---|---|---|---|---|---|---|---|---|
| | | Main canals and branches | Distributaries | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 *a* | 6 *b* | 7 | 8 | 9 |
| Periyar system. | 1912-13 ... | 139 | 139 | 1,06,31,523 | 1896-97 | 1896-97 | 1,05,25,017 | 17,90,002 | ... |
| | | * | * | | | | | | |
| | 1913-14 ... | 103 | 106 | 1,06,48,949 | ... | ... | 1,05,70,165 | 17,30,841 | ... |
| | 1914-15 ... | 103 | 106 | 1,06,56,559 | ... | ... | 1,06,17,349 | 16,41,359 | ... |
| | 1915-16 ... | 103 | 106 | 1,06,63,917 | ... | ... | 1,06,47,402 | 15,37,383 | ... |
| | *Arrived at an actual measurement. | | | | | | £709,800 | | |

## THE PERIYAR SYSTEM—*Contd.*

Financial Results of the year.

| Total sum of charge (Col. 7—8) | Gross receipts (direct and indirect) | Working expenses (direct and in direct) | Net revenue | Per cent on capital outlay. Col. 7 | Per cent on sum of charge. Col. 10 | Interest at 3·5 p. c. on direct capital outlay to end of previous year plus half the outlay of the year. | Net profit | Net loss | Per cent of working expenses to receipts (Col. 11—12) |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 1,23,15,019 | 6,05,628 | 1,79,127 | 4,26,501 | 4·05 | 3·46 | 3,55,316 | 71,185 | ... | 29·58 |
| 1,23,01,006 | 6,02,055 | 1,97,887 | 4,04,168 | 3·82 | 3·29 | 3,45,007 | 59,161 | ... | 32·87 |
| 1,22,58,708 | 5,97,799 | 1,50,390 | 4,47,409 | 4·21 | 3·65 | 3,57,927 | 89,482 | ... | 25·16 |
| 1,21,84,785 | 6,22,797 | 1,62,311 | 4,60,486 | 4·32 | 3·78 | 3,56,510 | 1,03,976 | ... | 26·06 |

The Periyar is the largest in India.

It irrigates approximately 130,000 acres of which about 40,000 grow two crops yearly.

Submitted by the Executive Engineer, Madura, Division, Feb. 14, 1917.

The Periyar Water Scheme may serve two purposes. It has been shown that it may be used as the water-power for the purpose of generating electricity for industrial uses. But it was designed for an irrigation scheme, and that must ever remain its primary function. Its value as an economic asset is great. Lands which formerly had difficulty in raising one crop of paddy in a year now produce two, and sometimes three crops in a year. One has only to visit such villages as Sholavandhan and Melur to see the great advantage which this assured water-supply has conferred upon these important centres. A visit to Sholavandhan sometime ago for the purpose of investigating economic conditions revealed some important facts. It is the leading village of a large Union, situated on the main railway line thirteen miles from Madura. It has the advantages of the Periyar Water-scheme, which have made it a veritable garden. The Vaigai River which adds to its water-supply in the rainy season is close by, hills are near, and the whole landscape gives the impression of peace and plenty. All castes are represented, there are 722 homesteads and a population of 4,385 including 600 panchamas. It is all practically wet land cultivation consisting of 1,700 acres: 700 acres are cultivated by the land-owners themselves, while 1,000 acres are tilled by servants on the usual conditions obtaining in that section. The Government land revenue amounts to Rs. 14,000 per year, averaging about Rs. 9 per acre. Paddy, of course, is the principal crop, making for the most part two crops a year; betel leaf, cocoanut and plantain production is also followed. A water cess of Rs. 4 per acre per year is charged. Manures and green leaves are quite widely used, averaging 25 cart loads per acre. Cattle dung is mostly used for fuel in the village. The total cost of cultivation per acre is Rs. 40. The people of this village are ambitious for progress. They are experimenting with their agricultural methods, such as—single

seedling, transplanting, better seed and better stock. The coming of the water scheme has meant a great deal to this village and the surrounding country.

Here is a typical family budget of one—Vellachamy Ambalam. Land-owner. Cultivates his own lands. He has eighteen acres. Owns a house and a cattle shed. He has two wives and two children and one servant. He has ten bulls, one cow, four buffaloes and four ploughs.

| Income. | | Rs. | A. | P. |
|---|---|---|---|---|
| 140 Kalams of Paddy, realising in a year about | ... | 770 | 0 | 0 |
| Expenditure. | | | | |
| Agricultural expenses | ... | 200 | 0 | 0 |
| Food bought | ... | 120 | 0 | 0 |
| Clothing | ... | 50 | 0 | 0 |
| Taxes | ... | 157 | 8 | 0 |
| Servant | ... | 50 | 0 | 0 |
| Other expenses | ... | 100 | 0 | 0 |
| Total | ... | 677 | 8 | 0 |

Balance—so that this man is able to save about Rs. 100 a year, which is invested in more lands.

At Melur I learned of the real reformation of a criminal tribe because of the water scheme. All through that countryside there lived a notorious criminal tribe of Kallars. They are professional robbers. At certain seasons of the year they would go out in bands, hold up people and steal from them on the public roads, snatch jewel from women, steal cattle, and were the terror of the community. It is said that in July which is the marriage season before a young man can have a girl for a wife he must demonstrate his bravery and fitness by stealing something of value from some one, and present it to the girl. But now, all is changed, since the coming of the Government Irrigation water scheme these kallars have been so busy cultivating their lands and doing so well as good and law abiding farmers that they have altogether ceased their old robbing profession, and are now a respectable and prosperous community.

The future of India depends upon the development of her water utilities. Water, of course, is absolutely essential to her agriculture, but water-power must also be employed as largely as possible for the development of her industries.

The future of India belongs to water.

## FOREST RESOURCES.

By P. S. Govinda Rao,

*District Forest Officer, Kadur District.*

THERE are few subjects so closely connected with the wants of society, the general health of the people, the salubrity of our climate, the production of our soil and the increase of our national wealth as our forests; and still fewer are the subjects to which our country is paying so little attention. It may, therefore, be stated, without fear of contradiction, that outside of food products, no material is so universally used and so indespensable in human economy as *wood.* Indeed civilization is inconceivable without an abundance of timber (*i.e.*, the chief product of our forest).

The evils of the past destruction of the forests are already manifold and the circumstances in which our country is now placed add an increased tendency for the multiplication of these evils. The evils of the past destruction are, at present, comparatively but few, when we think of the future large wants of our country. Tree growth is slow and normal restoration of forests tedious, though very interesting and all absorbing to forest man, while destruction is rapid and injury practically instantaneous. Delay, therefore, in combating the evils of the situation will be but adding to the difficulties; consequently, I beg to draw attention to this subject of *Forests*, the importance of which ought to be self-evident to all.

The cost of fuel in our towns has increased more than four-fold what it was a decade ago; while in villages and hamlets, especially in maidan and arid tracts, the supply of fuel has been redneed to next to nothing. The Railways and Steam-engines exhaust an enormous quantity of fuel and timber. Consequently the outcry for the same is

perpetually on the increase while the sources for supply are permanently on the decrease (to the consternation of the forester who finds his legs pulled and is impotent to conserve and to meet the normal supply). The timber has had equally its own share of scarcity, especially teak and valuable kinds, and the cost has increased in geometrical progression. Taking India as a whole, the 36,286 miles of the railways in it and 643 miles in Mysore which both for the dimensions and needs of our country, are nothing when compared to the lines of the foreign countries like England, United States, France and Germany, consume on an average 15,000,000 rupees' worth of wood for their sleepers, while nearly half that sum might be alloted for each year for the buildings attached to the Railway Department.

| India. | Miles. |
|---|---|
| Broad Gauge ... ... | 18,182 |
| Metre " ... ... | 14,806 |
| Narrow " ... ... | 3,298 |
| Total ... | 36,286 |

| Mysore. | Miles. |
|---|---|
| Narrow Gauge ... ... | 513 |
| Metre " ... ... | 103 |
| Tramway ... ... | 27 |
| Total ... | 643 |

The increase of knowledge or comforts of the progress of civilization 'whatever it may be called' among the inhabitants of our country has produced new fashions of buildings to which the rise of population following its law of perpetual growth, adds its own weight and want. The scarcity of wood and timber is attended with the scarcity and high value of the houses and materials constructed of wood, and pushes up the fares and freights for the use of such houses or materials. This is known to one and all of the high and middle classes and requires no further elucidation.

The evils of these consequences descend at once upon the labouring and poor classes of the inhabitants of the country, who suffer from want of lodgings and from the inclemencies of weather and are obliged to live upon uncooked food and to forego the advantages of peace of mind, good education, and sound health. Their whole earnings cannot procure them any of the partial comforts of life, while their children, which are generally many, multiply those miseries. While so, many evils are immediately caused by the destruction of forests and severely by the men of the country. The destruction of Forests does not stop but shall continue to go on with increased rapidity; and no healthy steps whatever, from forest point of view, have been earnestly taken in the way of conserving the state of our District Forests, which contain not a little of excellent timber and good fuel but also form almost the whole of sandal resource. Every day the Railways are extended. Every day enormous buildings raise up, every day tenders for timber are invited and offered, all at the expense of our ever thinning forests; yet no encouraging word or no serious thought of an energetic step in the direction of conserving or restoring forests is spoken or felt by the people of the country. On the other hand the reverse is ever conceived and harped on in and out of season to the disadvantage of the general public, and to the jeopardy of coming generation. The villages which only within the last ten or twenty years were girt with rings of trees, covering underneath many acres of land, can see now nothing around them but arid plains surrounding the sun-scorched fields, and clods-cleft tanks. The villages that within a few years were depending upon the fellings of their trees for fuels and implements, scarcely now possess a bush, that might be cut and used for a cow's post; while the animal manures which ought to go to improve the soils, are dried

as bratties and appropriated by men to cook rice for them, while they should be better employed for cooking the food for the rice itself.

While the denudation of forest growth in District Forest is continued without let or hinderance, the needs for forests in Mysore and their conservancy are cried down when they are to be too many and must be multiplying in hundred other ways on account of fostering industries and industrial concerns which are the order of the day to indicate the progress and prosperity of the country.

I have already said that the Railway lines consume, on an average 15 millions of rupees per annum for mere sleepers. This sum, perhaps, is open to objection as enormous if I do not show that it may be taken only as the minimum estimate. For every mile of Railways, are laid down 2,000 sleepers which need to be renewed every ten years; for each year thus the sleepers consumed for every mile of Railway amount to 200 sleepers on the average. Supposing that the sleepers cost at the lowest now Rs. 200 per 100 sleepers, the 200 sleepers consumed every year for a mile cost Rs. 400. Thus the entire length of Railways take up for the sleepers alone Rs. 14,771,600, or in rough figure 15,000,000, rupees worth of wood, speaking nothing of wood required for the future laying of new lines.

Again for fuel, the Railways cost a great amount. It is true many Railways use coal at present. But coal forms a resource exhaustable and non-restorable. Scientific authorities say that the supply of coal in Europe is calculated to last not more than three centuries, although scarcity will have to be expected long before that time. In America anthracite coal is said not to last more than 50 or 60 years under the present methods of working. With such specific authoritative assertions, the coal restriction regulation for industries and naval engines only, may, any day, be passed suddenly after the peace treaty is concluded, when Railway steam-engines will have to depend entirely on forest fuel alone. Then, the demand for fuel will assume such large dimensions that, then, even thin rocky soils of mountain Districts, which are worked now for scanty agricultural crop, will have to be appropriated for growing fuel on through sheer necessity. A Railway friend of mine informed me in all seriousness, that the annual consumption of fuel by Railway in India amounted to Rs. 3,000,000, some years ago. It must have now increased considerably.

The other requisites of the Railways, bridges, tunnels, stations, houses, carriages, etc., may be estimated as amounting annually to at least Rupees 5 millions worth in wood and timber.

Leaving Railways in this State, let me come to the wants of the people individually. The recent census counts the population of India nearly to 350 millions. Supposing that on the average a family consists of five members and that a house of average accommodation for each family consume for its building Rs. 300 worth of timber materials and that these materials are sound for 40 years at the end of which they require to be renewed, the average estimate of the need of the house materials in one year will amount to Rs. 515 millions.

The housing being taken as Rs. 515 millions, the average cost of fuel requisites can be, at the lowest, estimated as rupee one per head of inhabitants per annum, which amounts to Rs. 350 millions.

Again, the wood and timber used by the artsmen such as carpenters, chair makers, sawyers and coach makers and for mines, factories and telegraph posts, etc., are factors for which value in rupees, annas, and pies cannot be got at for want of proper data. My forest school Director once said that "*civilization is built on wood. From the cradle to the coffin in some shape or*

*other it surrounds us as a convenience or necessity.*"

What I have said so far is sufficient to show, I believe, how important it is for a country, to possess forests. Much more then is the importance of forests to our country where coal is scarce or is not discovered to exist in abundance and the probability is that we may not have even partially to supply the enormous requirements of this country. Before I end the subject of Forests as timber, wood and fuel producers, let me quote a beautiful passage from the *Economics of Forestry* on the point.

"The forest furnishes the cooperage to market our vintage, to store our flour and fruit. The forest furnishes the plough handle and harrow frame to cultivate, the threshing machine and wind mill to prepare the crops, the cart to bring them to market, the bottoms in which they cross the ocean to foreign marts and even the tar and pitch needed to keep the cargo safe. While iron ships have largely replaced the wooden bottoms in ocean travel, our coastwise and inland shipping, which requires a tonnage twice as large as the trans-Atlantic trade, is carried mostly in wooden ships. We rock in wooden cradles, play with wooden toys, sit on wooden chairs and benches, eat from wooden tables, use wooden desks, chests, trunks, are entertained by music from wooden instruments, enlightened by information printed on wooden papers with black ink made from wood, and even eat our salads seasoned with vinegar made from wood. The uses of wood, multifarious now, are constantly increasing. With the manufacture of wood pulp for cellulose an entirely new direction of use has been opened: originally designed to furnish a cheap substitute for linen paper, its application in many ways is growing daily, and promises for the future the largest drain on our forest resources, the manufacture of wood pulp having increased more than threefold in the last ten years."

Thus far I have dealt with the major produce, *i.e.*, timber and fuel of forests. You know that forest is the chief store-house of minor forest produce which forms such an important part of industries and industrial concerns. The details of this part of the forest resource I have studiously omitted to shorten this note as everyone knows what they and their uses are, such as tanning materials, gums, resins, fibers, vegetable dyes, lac, oils, honey, wax, roots, rhyzomes, grasses, medicinal herbs, etc.

Among other important factors of forests may be mentioned

1. Their influence on the precipitation of rain and the formation of springs.
2. Their influence on the climate of the country.
3. Their influence on the conditions of the soil and thus on the production of increased food-stuffs.
4. Their influence on the maintenance of rivers by the conservancy of catchment areas.

(1) Trees and forests cause, rather contribute to, the formation of springs and water-courses by means of the humidity which they produce or bring about and the obstacles which they present to the evaporation of water in the soil itself and by means of the roots that divide the soil like so many perforations and render it more permeable and facilitate filteration.

The following extract from Mr. Benson's report will amplify this factor of influence better than I can describe. "It is certain that the clearance of forests and the consequent drying up or draining of marshes and bogs have caused a material alteration, not only in the entire surface of the country, but in the supply of water to the rivers formerly derived from these reservoirs and in

the periodical amount of rainfall and the regularity of its distribution. Many streams, throughout the country, which formerly supplied large mills with unfailing water-power, except in the very driest of seasons, are now with vastly improved machinery requiring less power frequently unable to work and almost all are compelled to be supplemented by steam power to make good the deficiency.

The wolf spring in the commune of Soubey in France furnishes a remarkable instance of the influence of wood upon springs. A few years ago this spring did not exist. At the place where it now rises a small thread of water was observed after very long rains but the stream disappeared with the rains. The spot is in the middle of a very deep pasture inclining to the south. Eighty years ago the owner of the land perceiving that some firs were shooting up in the upper part of it, determined to let them grow and they soon formed a flourishing grove. As soon as they were well grown, a fine spring appeared in place of the occasional rill and furnished abundant water in the longest drought. For forty or fifty years this spring was considered the best in Clos-du-Doubs. A few years since the grove was felled and the ground turned again into a pasture. The spring disappeared with the wood and is now as dry as it was ninety years ago."

A well-known writer says: "Homer calls the mountain woodlands the habitations of the Gods, in which the mortals never fell the trees, but where they fall from age when their time has come. His tree and woodland nymphs, originating in springs, seem to suggest the suspected relation of forests and springs. The legend of Erichthonios most beautifully hints at the dependence of agriculture and forest cover; when by the fellings of a holy oak, he has offended the dryads, Ceres, the patronness of agriculture, is asked to send one of their number to the mountains of the Camasus to fetch Famine who takes hold of Erichthonios and kills him."

(2) The forest vegetation about the country generally influence the climate for the better. It makes the climate regular and uniform and preserves the regions under it from the extremes of temperature. It also regulates the distribution of water in countries situated under forests. It is said by eminent men that "Forest air is more free from Pathogenic Microbes. Especially those bacilli which develop in the soil, like the cholera, typhus, and yellow fever bacilli, find in the forest soil less favourable conditions for development, and owing to the absence of strong winds, are less apt to be carried into the air where they would be breathed by men. In fact, in the dense forest, where the variation of soil moisture is small and decomposing humous keeps the soil *acid* no pathogenic microbes have as yet been found."

(3) As regards their *influence* on the conditions of soil and thus on the production of the increased food stuffs, I may state that more trees means more manure and more food production of food crops. Trees and tree-growth have the power of binding the soil and thus they offer great protection from being washed away freely. The surface soil of the country, the soil within half a foot of the surface, is all that the country generally depends upon for its agriculture. In the absence of tree-growth or vegetation the accumulated rainfall rushes down with violence over the surface and washes off the friable loose soil with it and deposits all the rich and soft soil into tanks, ponds, and finally under the salt water of the sea through the flow of torrents and rivers into it. Thus many a costly built tank, major and minor, is silted to the woe of ryot and the ever increasing expenditure of the Department of Public Works budget by the destruction of tree-growth in the catchment *area*. The freshly laid open surface is devoid of active plant-food and

the requisite physical condition for the agricultural operations; while the existence of the same trees will afford additional manures to the soil in many ways. The sheddings of trees are decomposed and formed into active plant-food. The waters percolating through the soil under forests are likely to dissolve many ingredients useful for plant life and distribute them to the fields irrigated from that source. Trees again influence the external manure, cattle dung and by their being available for fuel.

(4) The conservancy of catchment areas in the interest of maintenance of rivers and non-silting up of tanks forms a very important subject on which volumes have been written and experiences noted. In lieu of my indulging on this point at length I would simply invite the readers' attention to the practical experiences noted on pages 39 to 53 in *Forestry in India* by Mr. B. Ribbenthrop, C.I.E., late Inspector-General of Forests to the Government of India.

Having said so much upon the importance of forests to one's country's progress, let me mention some of the steps that must be taken for tree-growth of all kinds, their culture and preservation in our country. There is now an enormous area of land fit and available for growing forest fuel and minor forest produce yielding trees in both malnad and maidan Districts, omitting wooded District Forest areas for which my views of management are definite. But most of them are now lying unproductive, such as thousands and thousands of acres of land annually relinquished and hundreds of thousands of acres of *karab* lands both in plain and hill sides in many localities. Large areas around or near village sites which are but too often covered with a noxious and offencive growth of prickly pear and lantana, etc., which from the habits of the people become insanitary, pestiferous and dangerous by giving shelter to wild animals such as tiger, panther, hyenas, etc. These lands might be far better occupied by groves of fruits or plantations of fuel trees or manure leaf producing plants.

When the lands are prepared for being brought under cultivation, under the present expansive system, instead of intensive cultivation system, the farmers very improvidently cut off all the trees standing on the land. They do not even think of keeping up the trees or leaving them unmolested on the edges of fields. The shrubs that may better serve as landmarks, if kept aside, for which kindness they will amply repay their benefactor with their sheddings, if not with fruits, they do not preserve.

In zones unfit for coffee growing, *darkhasts* are made for areas containing valuable trees for purely exploiting the valuable stock thereon and then relinquishing them. This unjustifiable profiteering in deciduous District Forest at the cost of Government should be prohibited. The liquidation of farm and inam debts is another cause of the destruction of trees; here first are felled the trees suitable for sawing, then those that can be hewn; the last for fire-wood and charcoal till at last the forest becomes crooked, weedy and composed of comparatively worthless trees and lantana.

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The number of palm trees which are usually tapped for palm sugar in the Madras Presidency is estimated by the Department of Agriculture as 2,500,000, and the yield of jaggery (crude sugar) therefrom as 35,000 tons (of 2,240 lb.). The total palm-sugar production of India, writes the United States Consul at Madras, is stated to be about 300,000 tons, of which Bengal produces about 100,000 tons, valued at £480,000. India's total production of sugar, both from cane and palms, is somewhere about 3,000,000 tons per annum. The area under sugar-cane in Madras is less than 4 per cent of the total area in British India, the United Provinces being the great producing area.

## INDIAN CURRENCY AND FINANCE.

By C. Gopala Menon,

*Member, Madras Harbour Trust Board.*

WHEN one goes through the reports of the Royal Commission or other documents relating to monetary affairs, it leaves the impression that currency questions in India have to be solved by custom more than anything else. It must be the case elsewhere also, but we would venture to suggest that the complicated problems of currency are so intricate that more than an amateur knowledge is needed to grasp the full situation. Few officials in India have made finance a study of his lifetime. Theory must be divorced from practice. A theorist once said that the rate of exchange had nothing to do with the exports of a country, but those who have actually spent their time in practical commerce would say how much the prices were affected by the rate of exchange, and what influence it had on the *cultivation and exports of a country.*

### A Ratio of Exchange.

It has been our trouble since 1870 to arrive at a parity of exchange, *i.e.*, to find out a ratio at which the Indian rupee may be exchanged at any given time for the English sovereign. What the Government of India has all along been trying to find out is a stable exchange, at the desired level, for the adjustment of her international trade balance. After a severe trial of half a century and more, the Government of India on the advice of the Herschell Committee stuck firm to its proposal of a gold standard, and formulated such schemes as would effectively maintain the rate of exchange at 1s. 4*d*. There was a period when the rupee was equivalent to two shillings sterling, and the parity between gold and silver was safely maintained—ten rupees and one sovereign always interchanged at par. The intrinsic value of the rupee has always been worth less than the official rate at which it was fixed, and from 17th May the Financial member of the Government of India has fixed its value at 1/8 a rupee. It is impossible for the outside public to know the intricacies of the currency problem. To a close observer of the Indian currency matters, the events since 1893, are nothing more than experiments carried out to suit the changing conditions of currency needed for a vast country like India. But the experiments did not satisfy the varying demands of internal or international commerce.

### Various Currency Legislations.

In 1893, the mints were closed to the coinage of silver, and the Government undertook to issue to the public currency notes and silver rupees in exchange for the gold coins and bullions at the rate of 1s. 4*d*. the rupee, or 15 rupees to the £ sterling.

The Government at the same time, undertook to accept, in payment of sums due from the public, sovereigns and half-sovereigns at 15 rupees to the £ sterling.

Act of 1896 authorised an increase to 100,000,000 rupees—the amounts which may be invested in securities of the Government of India out of the coin and bullion receive for currency notes. In 1891 the amou that could be so held had been fixed 80,000,000 rupees, so this act releas 20,000,000 silver rupees from the curren reserve, and replaced them by a correspon ing amount in securities.

In 1897, Government undertook to recei at the reserve treasuries, sovereigns an half-sovereigns, and to issue rupees in e change at the rate of 15 to the £ sterling.

Acts Nos. II and VIII of 1898, authoris the issue of notes in India against gold he in London by the Secretary of State for Ind as a reserve to secure the payment of su notes.

In 1898-9, the question of currency and finance was referred to a committee presided over by Sir Henry H. Fowler, M. P., and their investigation resulted in favour of gold being made a legal tender in India. By Act of 1899, sovereigns and half-sovereigns coined at any royal mint were declared legal tender in India at the rate of one sovereign for 15 rupees.

Acts of 1900 and of 1902 gave the Secretary of State power to purchase silver with the gold so deposited, and transmit it to India for coinage and also authorised the issue of notes in India against silver bullion held in England by the Secretary of State as a reserve to secure the payment of such notes.

Abnormal trade conditions in certain years disclosed the necessity for the supply of rupees and the strengthening of the rupee reserve. In times of adverse trade, provision has to be made for the withdrawal from circulation of any redundant rupees, to prevent a superfluity of currency. In order to meet this and other contingencies the "Gold Standard Reserve," was created. Into this reserve it was decided that the net profits on the coinage of the new rupees should be paid and these profits should not be treated as revenue.

### Chamberlain Commission.

Such in brief are the different currency legislations brought into effect until the Chamberlain Commission was appointed in 1913 to enquire into the location and management of the general balances of the Government of India, the sale in London of Council Bills and Transfers, the measures taken by the Indian Government and the Secretary of State for India in Council to maintain the exchange value of the rupee. This Commission came to the conclusion that the free circulation of gold in India is unnecessary on the ground that a gold standard has been firmly established without a gold currency, notwithstanding the fact that the Fowler Committee recommended that the British sovereign should be made not only legal tender but should be freely circulated and that the Indian mints should be thrown open to the unrestricted coinage of gold. It is, indeed, regretable that, after the introduction of a gold standard, which has been proved a success beyond doubt, the question of a free circulation of gold is considered unnecessary by the Chamberlain Commission. Sir James Begbie, however, added a minute of dissent to the commissioners report to the effect that the existence of a large amount of token currency is an undesirable thing to a country which so largely absorbs gold. This absorption of gold, he observed, is a clear indication of a keen desire on the part of the people for the use of gold as a currency and that steps must be taken to discourage the use of a token currency in the face of the established fact that gold is becoming popular for currency purposes.

### Circulation of Gold.

There was, however, some difficulty in freely circulating gold currency without the existence of a mint, but the European war, which followed a year after the Chamberlain Commission, put a stop to any attempt on the part of Government for establishing a Royal Mint and the Government had to deal with matters of exigency at the moment. In February, last year, on the advice of the Hon'ble Sir William Meyer, the Royal Proclamation establishing a branch of the Royal Mint was made, but the mint began the coinage of sovereigns only on the 16th of August last year.

There is, no doubt, that India has absorbed a large quantity of gold during the past four years, and this will continue as India is at present a great creditor country. For instance, India's trade balance for December, 1917, was fifty-one crores in its favour. For the period ending December, India had to get eleven crores from Japan, ten

crores from the United States, five from France, four from Italy, two from China, one from Persia, one from Turkey in Asia, two from South America, one from West Indies, nineteen from Egypt, five from Ceylon, and four crores from Australia. Such being her supplying capacity it is no wonder that India has absorbed so much gold being an unlimited tender and one possessing universal currency.

### Sterling Exchange and Value of Silver.

To a close student of Indian Finance and Currency, the announcement of the Secretary of State raising the sterling exchange on the 7th instant did not come as a surprise. It was in April last year a Simla *communique* was issued that in view of the United States Government making provision for melting down 250 millions silver dollars into bullion and for the repurchase by the American Treasury of the Silver at the rate of one dollar an ounce, it was found necessary for the Secretary of State for India to sell telegraphic transfers at 1*s*. 6*d*. and deffered transfers and bills at 1*s*. 5 29/32*d*. It was also announced that a corresponding modification will be made in the rates payable for imported gold acquired by Government under Gold Import Act 22 of 1917, namely, soveeigns shipped to India hereafter will be paid for at Rs. 13-12-0 a sovereign and descriptions of gold at equivalent rates. The Government was obliged to do this for purchasing silver in the United States and sell the manufactured rupees at a reasonable price. It is unnecessary to go into the provisions of the American Silver Bill for the supply of this metal particularly to India and the consequent modifications of the provisions of Indian Paper Currency Act. The only important provision is that the silver purchased for India from the United States and in course of transit should be treated as part of the Paper Currency Reserve.

### Appointment of Exchange Committee.

When the exchange per rupee was raised from 16*d*. to 18*d*., the importer had a distinct advantage of 12½ per cent. It was predicted in the London Exchange market in August last year, that the exchange would go up to 20*d*. if the price of silver continued to soar high. Silver has always been a depreciated currency and consequently the American Government had to protect their miners under the Bland, Sherman and Allison Acts and the consequent result was that there was a large accumulation of silver in the United States. In India, silver being still the currency for all transactions, the amount of silver rupees that had to be issued by Government was found to be so large, that the Government of India have to buy the large supply of silver lying idle in the vaults of the American Presidency. They have been melting down this silver and are selling it to the Secretary of State for India at the rate of 1 dollar per ounce. This is as matters stand and the price which the Secretary of State is obliged to pay for this silver will be more than the silver contained in the manufactured rupee. The Government of India finds it necessary to raise exchange in order to avoid a loss. This silver supply will be one of the important questions that will be brought up before the Exchange Committee in London, as also the extension of the Banking facilities and how best to find means to avoid the present hoarding habit in India. Nobody denies the existence of hoarding in India but it is a habit prevalent throughout the world. Facts go to show that the European countries have hoarded gold and silver not only during the period of war, and it is no use flinging this charge on Indians alone. Hoarding, of course, is a custom of the Indian inborn *post memorian hominum.* The saying is that "the gold dug up in South Africa is buried in South Asia." It is estimated that about 7,000,000 dollars in silver

are consumed in the United States for the purposes of arts and jewellary. How much gold must have been then hoarded!

BIMETALLISM.

Another matter that will be considered by the Committee is the invaluable services that will be rendered to a country by a highly organized and soundly conducted system of banking which would eradicate the custom of hoarding and cut at the root difficulty in its economic advancement. The system must be such as to lead the public to place implicit confidence in its methods. Half-hearted measures would do no good—a stern policy on the part of Government is needed. It has already been suggested in the London financial papers that India should go back to the mono-metallic silver. One of the strong exponents of this policy in India is our veteran authority on finance Sir D. E. Wacha, who has produced a mass of literature on the subject. One thing is a well known fact—no country in the world has a double standard now. Bimetallism has been rejected by all the nations of the world except India. We are still clinging to a system of Bimetallism and it is for the Committee to decide what should be our policy in the future, and which is the stable standard for this country, whether gold or silver.

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The Forest Products Laboratories at Madison, developed from "clabber" (casein) taken from the fine Wisconsin Jerseys a glue of remarkable adhesiveness. Woodblocks joined with it have held against ten days' soaking supplemented by twenty-four hours' boiling in water. The process is now available without cost of industry and enables any manufacturer of furniture to put together articles that will stand the test of any climate.

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## ECONOMICS IN THE WEST.

### Parliament of Industry.

*London, May 14, 1919.*—Slowly but surely we are turning from the troubled courses of the war to the paths of peace. There is much creaking of the machinery, there are many episodes which at other times would be disquieting but which we know to be a natural outcome of a period of unexampled strain and anxiety, and patience and temper are sorely tried by flagrant instances of official ineptitude. But on the whole there is progress—real progress—towards settled conditions. If we had not the evidence of our eyes in the revived congestion of the London streets due to commercial traffic and in the lively condition of the docks and the riverside we have before us the day to day figures of demobilisation which show how enormous is the number of men who have been absorbed into industry since the declaration of the armistice. British industry undoubtedly stands on sure foundations: probably it was never on sounder despite the unexampled sacrifices of the war. The country never had such magnificent equipment: at no time were its captains of industry more alert and enterprising. As for labour, even in that direction, the clouds are dispersing. The statutory body of employers and employed which the Government has created to deal with industrial questions carries with it the germ of a great and successful idea. In effect it will be a Parliament of Industry speaking and acting authoritatively on all matters pertaining to industrial life. It has already got over the critical initial stage not merely without difficulty but with the most perfect harmony and good will, and it only remains for ministers to give it the right work to do for it to become a permanent and valued part of our constitution. Mr. Wilson is so impressed with the value of the system that he intends,

it is stated, to take measures to set up a similar body in the United States when he returns home.

It is by no means improbable and India in a day not very far distant may find it advisable to have her own Industrial Parliament on the British lines with necessary modifications. The country is not unfitted by its habits of thought to the assimilation of the ideas which underly the recent innovation. After all, the Industrial Committees are not materially different in conception and intention from the *Panchayets* of immemorial Indian antiquity. That special sections of the community should settle their own domestic affairs through the agency of their own people specially chosen for that purpose is, anyway, the soundest of ideals, and provided the general interests of the people are safeguarded there is no possible reason why the system should not work advantageously. I am not sufficiently acquainted with existing Indian conditions to say whether there is yet adequate intelligence amongst the artisan class of the factories to ensnre the successful introduction of the Industrial Council system. But if I interpret aright some of the most recent developments in India I can perceive the danger of leaving the organization of the workers entirely to outsiders. Nothing would be more fatal to Indian Industrialism than to harness it to the political chariot. That way lies disorder, lack of credit, stagnation and possibly even death for some of the more delicate branches of indnstry. The true course for the Indian Industrialist is the promotion of the development of the country on perfectly independent lines. This does not mean, of course, that he is not to have an opinion of his own where political questions are concerned. All it implies is that he is not to mix up what have no relation to each other, and as he does not interfere with politicians to permit no politi-

In connection with this question of the relation of Indian Industrialism to politics there was an interesting letter published in the *Times* recently from the pen of Mr. D. M. Wadia, who needs no introduction to my readers as one of the most successful captains of industry in Western India. Mr. Wadia states that he has always refrained from taking any active part in Indian politics, " for I hold," he says, " with strong conviction that industrial and social reforms are the only foundations upon which any satisfactory political advance can be based." It will be a bad day, the writer thinks, if labour is allowed to fall into the hands of the political extremists.

" Their pretended interest in industrial questions is a mere pose. They wish to draw Labour sympathy on their side, so as to use it for political ends whenever the occasion arises. Their so-called sympathy with the workers is used as a disguise for aims which are really subversive of the prosperity and general progress on which the economic future of India depends." Mr. Wadia is well aware that the conditions of Indian labour must be improved and he suggests housing as a matter which especially calls for reform. But he has no faith in violent courses. " The Government with the co-operation of the employers, must educate the workers for that is the foundation upon which continuous amelioration must rest." " By all means," he concludes, " ameliorate the lot of Indian labour. Make it more amenable to helpful influences; let the workers realise that they are human beings and not slaves or mere machines. Bnt at the same time every measure that is taken must be weighed, measured and gauged in the scales of both common sense and statesmanship." Wise words these! Will they be listened to? Time will show; also it will reveal probably how mischievous for the progress of Indian industry has been the recent sinister association of the forces of

## Utilisation of X Rays.

Great and beneficent work has been done in surgery in the past years of war by the utilisation of the power of X rays to bring to light hidden conditions of the bones. But it is by no means alone in the sphere of human improvement that the discovery has been turned to account. According to an interesting paper read by Sir Robert Hadfield at a joint meeting of the Faraday and Röutgen Societies recently the rays were extensively employed in locating defects in metal castings—defects such as blowholes which could not be detected by external inspection and which may yet seriously impair the strength of the finished article. The lecturer stated that if the castings were not too large each of them might be subjected to routine testing by the rays, and irregularities corrected. Rough analysis of different steel was also feasible. Thus, if a number of carbon steel and tungsten steel bars had been accidentally mixed up together they might be quickly sorted out by means of X rays. "The radiographs obtained with the former are blacker than with the latter because the rays penetrate the tungsten steel less freely than the carbon steel owing to the higher atomic weight of the constituent tungsten." The method, however, has its limitations, because at present the rays can be made to penetrate only a few inches, about four at the most, of ordinary steel and a still smaller thickness of special steel alloys. Nevertheless, in view of the improvements which are being made in the process by the aid of the Coolidge X Ray tube and of existing currents at very high electric pressures, the future holds great possibilities. Even as the process stands to-day it is an enormous advance on any thing that existed at quite a recent period. For the manipulation of metal parts designed to carry a great strain and the failure of which would produce disastrous consequences, it must be of inestimable value.

## The Plant Doctor.

Tropical agriculture plays so important a part in the life of the British Empire that more than common interest attaches to a suggestive description of "the Plant Doctor," as he has been evolved, or at all events, developed, by the war. The plant doctor belongs to the Imperial College of Science at Kensington. He is the product of a department, of which Professor Farmer is the head, for training men in the knowledge of the maladies incidental to particular plants and in the general physiology of those plants. "As a general practitioner has to know a great deal more than anatomy, so these students are encouraged to learn the whole constitution of a plant, both in its strength and weakness. Many have been sent out to the Eastern and Western tropics to deal scientifically with various aspects of agriculture; and while they have been grappling with this or that disease, new diseases have showed themselves, which in their town have to be investigated and, as far as possible, conquered. The economic botanist has justified his existence; he has also demonstrated that without his aid agricnlture is sadly handicapped in the strife with pests and disease; and the sphere of his conquests ranges from rubber to gooseberries." Altogether a very valuable acquisition to our list ofpublic scientists is this plant doctor. His speciality is that the whole world is his parish. He is at home as well in the East as in the West. Indeed, it is probable that in the tropics he will find, if he has not already found, his most congenial sphere of work. I can imagine no finer career for an aspiring, intellectual young Indian than that opened up by this department of the Imperial College of Science. The time will probably come when every plantation will have a plant doctor on its staff or visiting it regularly in the same way as it employs a medical officer.

## Mineral Wealth of India.

A great many years ago, nearly forty, I am afraid, when occupied in an editorial capacity

in Bombay, I one day received a visit from a gentleman anxious to interest me, and through me the journal with which I was connected, in the great mineral wealth of Central India. He brought many specimens of ore which he had picked up and amongst them some particularly rich examples of lead ore. I was only able to give him cold comfort as to the support which could be extended to his venture, as those were days when no one was greatly concerned in industrial development and the public looked askance at anything in the nature of mines; it had burnt its fingers over some swindles and dreaded the fire. The prospector passed on his way to obscurity, but his enthusiasm in speaking of the mineral wealth of particular districts in Central India has lived in my memory and I always recall it when the mineral productiveness of India is under discussion. The episode of which I speak recurred to me the other day when I read in the *Times Trade Supplement* a rather interesting article surveying the Empire's resources in lead ore. The writer states that the world's production of lead averages about 1,130,000 tons a year of which the United States supplies about 35 per cent, Spain 18 per cent, Germany 15 per cent, and Australia a little over 10 per cent. The other producing countries are Mexico, Belgium and the United Kingdom, Austria-Hungary and Italy. India does not figure in the list at all as a producer, she is merely shown to be a consumer in 1915 of 8,087 tons of lead. I wonder whether the story told of rich lead deposits in Central India by my visitor of forty years ago was a fairy tale or whether this natural wealth really exists. I wonder!

ARNOLD WRIGHT.

## NOTES.

During the war Germany was in great need of rubber, which was unobtainable owing to the blockade. Her chemical engineering industry has, therefore, been very busy in endeavouring to produce substitutes; and a partial success was, apparently, achieved in the production of one or two synthetic substances which in some way are said to have answered the purpose; whilst of others, although substantial similarity to the genuine rubber was evident, the production could not be extended beyond the experimental stage, owing to the want of the necessary material or compounds. In the latter category was included a rubbery substance which could be obtained from a common plant which grows in abundance in North Africa, as well as in the Near East. It is of the species *Euphorbia*, consisting of shrubs or large trees (*tithymalus peplus* and *cyparissias*), commonly called in Greek *flomos*, and in Arabic *forbion*. In either form this plant contains a milky, acrid juice, which is sometimes poisonous, but is known to abound in caoutchouc (india rubber). The juice of these species of *euphorbia*, either exuding naturally or from incisions made in the bark, hardens in the air, like ordinary gum, and takes a light yellow colour. But to return to the German experiments; these have shown that the sap of the *euphorbia* contains one to three per cent of rubber, and if plants of the species *cyparissias* and *tithymalus peplus* are dried and reduced to a coarse powder, from which, by treating it with benzine, ether and carbon tetrachloride, an extract of the dark green colour is obtained which consists of two-thirds to one-half of fat. By dissolving this extract in ether and adding alcohol, a rubbery substance is derived, corresponding to 20 per cent of the extract. Assuming that one square mile of pasture land would produce an average of 1·2 kg. of fresh *tithymalus peplus*,

this represents 4·3 g. of rubber and 12 g. of fat, or 43 kg. rubber and 120 kg. fat per hct. Thus, with an increasing cultivation of *euphorbia*, considerable quantities of rubber and fat could be extracted by the installation of suitable plant for the purpose. And the undesirable and repulsive *tithymalus*, or *flomos*, in the Near East, would thus become the base of a great industry and a source of wealth.

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Of the total area of the United States approximately 24 per cent is forested. Statistics secured during the past three years (1915-1917 inclusive) indicate that the average annual damage caused by forest fires amounts to approximately ten million dollars, and that there are upward of 28,000 forest fires annually in the United States. The chief object of forest patrol work is protection against fire. For this purpose the present method of detecting fires is by means of a system of well-selected look-out peaks. Mr. Henry S. Glaves, Chief of the U. S. A. Forest Service, is of opinion—although no experiments have as yet actually been carried out—that the method of detection of fires could be greatly improved by the use of aeroplanes. Several disadvantages of aircraft for the purpose are brought forward. As a means of prompt detection of fires in rolling or flat country it is doubtful if aircraft patrol could be excelled, and it is probable that by adopting aircraft patrol the numbers of men required could be reduced. Besides their use for fire detection, according to *Aviation*, aircraft would be very useful for scouting on large fires. It is the duty of a fire scout to determine each day how the fire is progressing in order that it may be fought to the best advantage, and in country where getting about from one place to another is difficult the use of air craft would be especially advantageous. It is suggested that aeroplanes might be employed for the speedy transportation of fire fighters from point to point, and, further, that aeroplanes of the bombing type might even be of use in fighting fires by the dropping of fire-extinguishing bombs.

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The Government of India have had for some time past under their consideration the question of the continuance of the Cambridge Local Examinations as recognized examinations for European schools in India. After a comprehensive examination of the system and its actual working, they have now come to the conclusion that in respect of European schools the Cambridge examinations have, in the absence of a well established system of departmental tests, a claim to be utilized in India and they have agreed to the retention of the examinations subject to the following conditions which will be applicable in the case both of Indian and European students, *viz.*—(*a*) that the Local Secretary to be appointed by the Cambridge authorities for the purposes of these examinations in each province should be an officer nominated and approved by the Local Government; (*b*) that no pupils should ordinarily be admitted either for the Senior or for the Higher school certificate who have not been working at approved schools for a period of years to be fixed by the Local Governments concerned; and (*c*) that without absolutely excluding the entry of students other than those admitted under (*b*) the admission of such students should be subject to such provisions as may be laid down by the Local Governments. The Government of India would expect the provisions so laid down to admit of the entry of such students in very special circumstances only and on conditions such as the receipt of a certificate from an educational Inspector that the student has pursued a regular course of study under proper discipline and has, after personal examination, satisfied the Inspector that he is fit to enter for the examination and has special reasons for requesting to appear at it.

The *Madras Mail* writes :—Now that Sir 'rederick Nicholson has reduced his activities in connection with fisheries he is evoting his time to examining certain minor ıdustries and industrial problems. He ; opening at Coonoor an industrial labora- ›ry on a small scale to investigate the ossibilities of some minor industries which ·ill include the manufacture of vinegar, ıks, adhesives and certain toilet soaps, and ıe mode of putting them up, and the ex- ·action of certain volatile oils and essences ·om various oderiferous plants which will row in and near Coonoor. For these and ther such desirable product the whole presiency has to depend now on outside supplies. There is not a single ink factory ı the presidency and all these foreign roducts are sold at high prices in the local ıarkets. Sir Fredrick Nicholson feels that n attempt can with advantage be made ɔ produce these articles in the country. :olonel Cornwall, I. M. S., Director f Pasteur Institute, has agreed to place t Sir Frederick Nicholson's disposal a acant laboratory at the Institute and Govrnment have sanctioned Rs. 6,000 for inial expenditure in the purchase of raw maǝrials and plant. Government are also proiding a chemical assistant and the subordiate staff.

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In the course of a lengthy note submitted y the Bengal Chamber of Commerce to the ndian Currency and Exchange Committee, ıe Chamber, after an elaborate examination f the effect of the war on the Indian exhange and currency system, say that they do ot consider that by debasement, inconvertiility or any other expedient alone, it will be ossible to satisfy the requirements of trade. 'he requirements of trade demand stabity at as low an exchange rate as is in ıe present circumstances, possible, and the hamber believe that this can only be brought bout by the combination of (1) readiness and power of Government to sell councils or reverse counsels to the extent of trade requirements within certain maximum and minimum rates, (2) recognition of the right of India to the free importation of both gold and silver, (3) provision of ample gold standard reserve of which a large proportion must be held in gold, (4) provision of a large metallic backing in the currency note reserve, (5) power to Government to refuse the encashment of notes temporarily, as a last resort, in the event of the price of silver rising above the exchange value of a rupee. Without further knowledge of silver markets and production, the Chamber are not prepared to name the rate of exchange at which the securing of stability is possible, but they hope that it will not be found necessary to fix the rate higher than that ruling to-day. Finally, before all other considerations, the Chamber place stability.

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It will be remembered that one of the Resolutions passed at the last meeting of the Board of Agriculture was that "in view of the great distance over which concentrated manures must be carried in India from the centres of supply to the fields of cultivators, the Board is of opinion that the question of reducing internal railway rates charged on such manures should be considered by the Railway Board". The Government of India have considered the recommendation and have now issued a circular letter on the subject to all Local Governments and Administrations. At present manures of all kinds, including chemical manures, are booked at rates between the specially low fixed maximum and minimum of one-third and one-tenth of a pie per maund per mile respectively, these rates being at railway risk, and the Government of India were in some doubt whether any further concession was necessary. The Conference of Agricultural Chemists held at Pusa in February last considered the matter and held that an all-round reduction of freight would lead to a greater

utilization of manures and that this, in turn, would result in increased transport of produce over the railways. They accordingly passed the following unanimous resolution:—"That in view of the importance of increasing the use of concentrated manures as a part of the general agricultural development of the country, the Railway Board be approached to arrange that the present minimum rate of one-tenth of a pie per maund per mile should be charged for complete wagon loads of concentrated manures." The Government of India do not consider it practicable to ask the various Railway Companies, irrespective of local circumstances, to adopt an absolutely uniform rate for the carriage of manures. At the same time they have impressed on the Companies the vital importance to Indian Agriculture of keeping the price of manures as low as possible and have requested them to give special consideration to all applications for reduced rates which may be made to them. It is left to local Governments and Administrations, in specific cases where this is considered necessary, to address the local railway authorities with a view to a reduction in the rates at present charged on concentrated manures.

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The Bureau of Electrical Exploitation, Department of Communications, Tokyo, has issued a pamphlet dealing with the Water Power Survey of the Japanese Government, an English translation of which has been received from the Commercial Secretary, British Consolate General, Yokohama. The object of the Survey is to investigate all possibilities for hydro-electric power sites for industrial purposes and to collect necessary and reliable data for future hydro-electric undertakings in Japan. The work includes the reconnaissance and investigation of power sites, their available heads and the discharge of rivers throughout the country. The power sites to be surveyed are those where more than 1,000 H. P. at draft can be acquired by economical exploitation. Much importance is attached to the establishment of extra gauging and rainfall stations and the pamphlet contains an elaborate programme of the work to be done. The survey work was initiated last year with an appropriation of 195,544 *yen* and is expected to be completed in 1922 at a total cost of 830,657 *yen*. In Mysore, a similar survey would be a great help to industrialists.

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Mr. H. A. Carter writes to us, under date London, 17th May:—It is reported in London that inventors in the United States of America have lately perfected an easy method of spinning a good ramie yarn over ordinary cotton spinning machinery, a thing so far impossible. I have also seen samples of another fibre much longer in the staple than cotton spun into a good yarn over cotton machinery. I think the above report respecting ramie, which is also as you will know much longer in the staple than cotton, is true, and if so, they say in London it will lead to a great increase in Europe and America in Ramie spinning. The United States Government Bureau of Domestic and Foreign Trade, Washington, U. S. A., will be able to inform those interested if the report is true, and if so, which seems likely, to tell them the address of the inventors who will probably be willing to supply cotton spinners with full mechanical details of how to accomplish the spinning. All who grow plant Ramie in India should plant *close* because this method of planting produces tall *straight* stems, and the more straight the ramie stems are grown the easier they are to decorticate in machines for decorticating this fibre such as I, and a friend of mine, have invented. This is most important for the success of the ramie and China Grass Industry, and every planter in India and our colonies should know it. What Mons Faure Limoges, France, says, *viz.*, that he gets a yield of two tons of useful saleable fibre per acre, per annum, in ramie culture, at Limoges, in the South of France, seems further confirmed by a book which has

been published here, the author of which is a Mr. Oakenfull, J. C., called *Brazil in 1913* which says, "One Hectare (2½ acres) of land in Brazil should yield 4 crops of Ramie yearly of 40 tons each, 160 tons in all at 16 sh. to 20sh. per ton." This obviously refers to green ramie stems denuded of their leaves, which at 5 per cent yield of clean fibre would give about 2 tons of clean fibre, that is, China Grass, per acre per annum.

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"We think the machine will also do good for jute. Jute is the weakest of all the textile fibres in strength. Many English and Germen experts think that this lack of strength in jute does not arise so much from faulty cultivation as the Government of India seems to believe as it does from the system now pursued of separating the jute fibre by water retting process and they think if this separation was accomplished instead by a really perfect machine decorticator, the jute fibre would be very much stronger, and so would command higher prices in commerce, and be available for superior manufactures to those for which it is now used. It is confidently believed the machine will decorticate or separate the jute fibre quite as successfully as it will decorticate ramie and produce a much stronger jute fibre tban the present and one which by special provisions which we have made in it will be quite as soft in quality and of as good colour as water retted Jute. Dealers set great value on the latter and so far have thought machine decorticated jute was not as soft as water retted Jute but we hope to prove to them that they are mistaken. The German experts gave this as their opinion before the war; of course, while the war has been on we have had no communication with them.

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At the seventh meeting of the Industries Section of the Board of Industries held at Naini Tal on the 14th June, 1919, the following among other matters were dealt with:—It was decided to recommend to Government that State Technical Scholarships in the following subjects be awarded during the year 1920:—(1) Glass-making, (2) The Dyeing of Textile Fabrics, and (3) Electrical Engineering. On a previous occasion, a scholarship in glass-making had been suggested by this Board, but as it was subsequently explained that facilities did not exist in England for giving a really first class training, the matter was not proceeded with. The Board expressed the opinion that it was possible for conditions in this industry in England to have altered considerably since then. But if such should not be the case, arrangements might be made for the students to be trained in America or Japan, preferably the former place. A note regarding the preliminary training of Mr. Mahesh Prasad Bhargava, a nominated State Technical Scholar, who is to proceed to England in August next to pursue a course of training in Grass Pulp working, was approved by the Board. For the purpose of carrying out experiments in the manufacture of glass, using the sodium carbonate which is manufactured locally from Reh deposits, the Board recommended that a grant of Rs. 5,000 for this purpose be set aside.

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We publish in this issue an article on Industrial Research in the United States of America written by Dr. Fields, Ph.D., F.R.S., to the *University of Toronto Monthly*. The article deserves to be read and pondered in this country, for what Dr. Fields describes makes not only interesting reading but also points to the need for development work of a similar kind out here.

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## GLEANINGS.

At the meeting on May 22nd of the Royal Commission on Income-tax, under the Chairmanship of Lord Colwyn, at the Surveyors' Institution, evidence was given by Sir Charles Campbell McLeod (Chairman of the Imperial Commercial Association and of the East India Section of the London Chamber of Commerce) on the subject of the imposition of double income-tax as it especially affects India. He stated that such double taxation reacted adversely upon the Indian Exchequer, and retarded the development of India's natural wealth and staple industries, because her trade and commerce were largely financed by capital belonging to British subjects, who are called upon to pay double income-tax in respect of their Indian interests. Income arising in India should be regarded, he said, as a preserve sacred to the Indian Exchequer. Where the income was that of a man who had worked in India, made his money there, and left it there for the purpose of his business, although he himself now resided in the United Kingdom, he suggested that in any case British income-tax should only be levied on such Indian income as was remitted to this country. He suggested further that there should be no British taxation levied on the profits of companies operating solely in India or the Dominions. The main object to be achieved, he submitted, was to avoid the tax-payer having to pay two income-taxes within the Empire, and that the distribution of any tax raised should be a question of negotiations between the Mother Country and the Dominions.

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An electric melting furnace that may revolutionise the making of brass has, according to the *Board of Trade Journal*, been perfected by the Bureau of Mines but it has not been put on the market for profit. It is known as the Electric Rocking Furnace, and patents have been taken out by the Bureau. The new furnace is the result of five years' experiments by the chemist of the Bureau, in co-operation with the Cornell University, the American Institute of Metals, and a number of manufacturers of Brass. Up to the present most Brass has been made in the United States in costly crucibles of imported clay and graphite. Since the war it has not been possible to obtain the imported materials for crucibles and manufacturers, it is stated, have had to put up with a very inferior brand at a cost many times over that of pre-war times. It is estimated that unnecessary losses in Brass-making are more than 3,000,000 dollars a year in normal times, and perhaps 10,000,000 dollars in war times. The Bureau of Mines states that it is inevitable that the next few years will see electrical furnaces, and there will be a development comparable to that seen in the steel industry in the last few years.

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It is reported that the Japanese have been suffering for the past few years from an abnormal rise in the price of rice caused by a shortage in Japan, and that, with a view to relieving the situation, attempts have been made to import large quantities of foreign rice with the result that there has been a decline in local prices. The Government of Japan have recently introduced a bill providing for the encouragement of Agriculture, supplementary to a scheme which the Government have in contemplation for the organization of a large Agricultural Company with a capital of 30 million yen, supported by influential business men throughout the country. The Department of Agriculture and Commerce, Tokyo, has further obtained a credit of 140,000 yen for the present fiscal year for the encouragement of afforestation by the distribution of young plants among farmers, particular attention being paid to the planting of bamboos. [One yen=2*s.* 0½*d.*]

From a report on the International Fair, held recently at Lyons, we note that the Austin Motor Company were exhibiting a Tractor for farm purposes capable of ploughing three furroughs ten inches wide and six deep in practically any land. It requires petrol for starting, but kerosine is the normal fuel, the consumption being about two gallons an hour. When not in use as a Tractor for ploughing, harrowing, reaping, etc., or for driving standing machinery, the motor is made suitable for road haulage purpose by removing the steel studs from the driving wheels, and substituting India rubber pads; with these attached it will haul four tons on a gradient of 1 in 12 at five miles an hour.

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Plans for the erection of a plant in Trinidad for the manufacture of Bamboo Paper pulp have been completed. The machinery has been ordered from the United States of America. The shortage of paper has caused a Scottish publishing house, in order to make sure of its future supplies, to turn its attention to Trinidad. This firm has planted 1,000 acres of land with bamboos, in addition to securing a concession to cut bamboos on crown lands in the Island. In due course paper pulp will be manufactured from the Bamboo. There are still people in India who doubt of the possibilities of the bamboo in the paper line.

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Mr. Pilgrim, tanning expert to the Government of India, in his report to the local Government, considers the samples collected in his mangrove forests and elsewhere likely to yield as in Borneo a saleable red tan extract, but has a much greater belief in a species of carapa, if this could be obtained by cultivation in sufficient quantities. As it is a timber tree, its use for tanning purposes may only be possible in districts where nothing is done with the timber. He recommends tests of the tree by the periodical stripping of the bark.

Additional evidence of the hold which Japan has secured on the Indian market is furnished by the annual report on the maritime trade of Bengal for 1918-19. The average value of the imports from Japan into Calcutta for the five years ending with 1915-16, was Rs. 148 lakhs. In 1917-18, it amounted to Rs. 603 lakhs, and in the year under review it rose to nearly Rs. 1,139 lakhs, representing a little less than 18 per cent of the total foreign import trade of the port. The number of Japanese vessels entered and cleared at Calcutta during the year was 131, as compared with 94 in the previous twelve months.

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From the *Travancore Government Gazette* it is seen that Messrs. George Brunton and Sons, Engineers, Cochin, and Chekoo George Papuli of Ernakulam have patented one invention for "improvements on and cheapening of the manufacture of match boxes and matches." The original inventor is Papuli and the firms claim a new process of manufacturing match boxes from the leaves of the Cocoanut and Palmyra palms and match splints from the ribs of Palm leaves.

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The average daily circulation of the *Advertiser of Adelaide* is 66,218 copies. The population of this town is 200,000 and that of South Australia 450,000. In proportion to population no newspaper in the Commonwealth has a circulation as large as that of the *Advertiser*, which is more than three times than that of any daily paper published in South Australia. When will our people know that advertisement is the road to commercial success?

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The new paper mill to be erected by Messrs. A. E. Reid & Co., Ltd., will stand in the Parish of the New Hythe. It is said that this mill will be the largest in England and will contain a dozen modern paper making machines. This mill will give employment to several hundred paper workers. When is the first Mill in Mysore to come into being? We are still in the discussion stage.

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A preliminary forecast of the jute crop of 1919 has been issued. A consolidated statement for Bengal, Behar and Orissa and Assam states that the estimated area under jute in

the three Provinces is 2,749,120 acres, an increase of 248,738 acres, or about 9.9 per cent on last year's final figures. The increases of the preliminary forecast this year on the final forecast last year were:—Bengal, 182,037 acres; Behar and Orissa, 53,501 acres; Assam, 13,200.

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Two hundred thousand acres of forest land in Great Britain are to be replanted, at a cost for planting and maintenance for the first ten years of £17,000,000, according to an annonncement by the Government. The trees will replace some of the heavy timber cut down during the war, and provide additional forests so that the country may be independant of other timber sources in case of emergency.

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With a view to encouraging the cultivation of 'dry' food-grains to meet the present scarcity of food the Government are pleased to declare that any person raising 'dry' food-crops on unoccupied assessed Government land that has not been cultivated in faslis 1327 or 1328 anywhere in the Madras Presidency will be exempted from assessment during fasli 1329. Collectors are requested to give wide publicity to this order.

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The *Board of Trade Journal* for May 8 contains an illustrated supplement dealing with the arrangements made by the Board of Trade for the British Industries Fairs of next year. The scope of the fairs will be largely extended, and they will be held simultaneously in London (Crystal Palace), Birmingham, and Glasgow. The three fairs are distinct from one another in regard to exhibits and trades.

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A report of the seaborne trade of Bengal for 1918-19 shows that the aggregate value of the whole import and export trade was over Rs. 206 crores, which is a little short of the highest pre-war figure. This represents an increase of Rs. 35 crores over the figures of 1917-18. The increase is shared by both imports and exports, working out in the former case at 16 per cent, and in the latter at 21 per cent.

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The Madras Government have given up the idea of establishing a Mechanical Engineering School at Cocanada. They have directed the Director of Industries, Madras, to report whether schools on the model of the Madras Trades school cannot be usefully opened at one or more places in the Northern Circars at which there are public works, workshops, railway works or rice, jute or other factories.

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Referring to the discussion of the Sugar question in this *Journal*, Mr. Hamel Smith of *Tropical Life* says:—"The *Agricultural News* and the supporters of the Cane Sugar may be glad to know that in all probability the matter will again be discussed not only in America but in a London Trade Journal, and also in a Southern Indian Montbly which has already published several articles on Pan-British Sugar Productions."

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As has been frequently pointed out in this *Journal*, India, if properly equipped, could be made to produce on its present acreage a surplus of sugar; more than enough to satisfy its deficit of 800,000 tons, and sufficient even to satisfy Great Britain's needs were the brains and ability present in India did all that has been done so much of late for sugar production in Cuba and Java.

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The latest imposed in Corea is a Sugar consumption tax, which took effect on 1st April last. It is levied on sugar, molasses and syrup on a gradnate scale. The tax is to be paid at the time of taking over sugar, molasses or syrup from a factory or bonded zone by the person taking it over. The tax may be remitted by Government on sugar, etc., exported to forign countries or Japan.

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Attention is drawn in an American consular report to the developing of a market in Colombo for earthenware and porcelain lined sanitary batbroom installations.

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Imports into British India in March increased by £2,897,000, whilst exports decreased by £2,366,000, as compared with last year.

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The Turkish fig crop in 1916 is reported to have been about 19,000 tons, 16,500 tons in 1917, and 18,000 tons in 1918.

# TOPICS FROM ECONOMIC PERIODICALS.

## ENGINEERING TRADE IN INDIA.

The *Near East* of May 19, says:—

The Indian machinery market needs special attention on the part of British engineer manufacturers in view of the increasing industrial activity in Japan, especially in the production of modern types of agricultural and industrial machinery, and of the systematic efforts of the Japanese manufacturers to introduce their products into that market. Of course, the Japanese are not the only competitors there, for there are the American and Continental manufacturers, who are also endeavouring to secure a firm footing in the Indian market, and who, by studying local requirements and assisting prospective native purchasers with much-needed and appreciated advice, gradually gain the latter's confidence and their own purpose. Their energies are not confined to the principal centres; they also extend to remote districts, which, apparently, are somewhat neglected by British manufacturers. The latter should bear in mind the important fact that while the Indian purchaser in and around the large centres has every facility for obtaining the articles he requires for any industrial purpose there is a strong and persistent tendency towards the creation of new industrial enterprises under modern methods in the more remote districts. Purchasers in such localities, while anxious to develop the resources of their country, and knowing perfectly well what they want to do, are in many cases without knowledge of where the plant required can be procured. The Government of India and some of the Provincial Governments have appointed officers to assist prospective purchasers with advice; but, valuable as this official assistance is, it is not sufficient; and British manufacturers must take an interest in this question themselves. For instance, when an inquiry from such sources comes through for a plant of machinery it is useless for a manufacturer to quote for a portion only. He should estimate for the whole thing, whether he makes all the appliances himself or not, as the purchaser is quite unable to piece together a number of estimates from a variety of sources into a practical whole. If, while in such perplexity he applies to, or is approached by a non-British manufacturer, the result is obvious. Such opportunities aid the efforts of the latter.

BRICK AND TILE INDUSTRY.

There is a good opening for modern machinery for the manufacture of bricks, tiles, slabs, water-pipes, etc., in India, and manufacturers of this machinery would be well advised to investigate the prospects there. The tile industry was first introduced into the southern districts of India in 1865 by the Basel Mission, the factories of which gradually developed, and run now on up-to-date lines, in which every modern invention finds a place, the whole machinery being driven by steam. There are now over twenty-eight tile-factories in Mangalore, the first home of the industry, among which the works owned by the mission and two or three other firms are reputed for the quality and quantity of their output, which includes side products of a variety of descriptions, but especially for their ornamental cement flooring tiles, which are very popular with the house builders. The annual joint output of three factories in roofing tiles is estimated at over Rs. 100 lakhs, under normal conditions. The Indian-owned factories employ the bulk of the 2,000 or more operatives, who are seen every morning wending their way to one or the other of the many factories which occupy the two sides of the town, bounded by the river. About six of the Indian-owned factories are driven by steam, and produce tiles which are a decided improvement upon the article made by the old methods and packed in the old pattern firewood kiln. The annual output of roofing tiles ranges from thirty to forty millions, and depends upon the foreign market, the local sale being insignificant. This industry seems to be the only one which has not been affected by the war. Probably this fact is an encouragement to further enterprises, for it is announced that the establishment of modern brick and tile factories is contemplated in other parts of India.

IMPLEMENTS AND TOOLS.

According to recent reports, it is evident that with regard to the trade in implements and tools generally in India the British position has not been seriously assailed. It is, therefore, recommended that British manufacturers should continue to supply their well known lines, keeping the price as low as possible, in view of the competition of Japanese and locally-made substitutes and of the well-finished American specialities. In cutlery it may be said that the Indian market is waiting for the full resumption of British supplies. Here Japan and, to a smaller extent, America are the only countries which have made any progress towards occupying the place formerly filled by Germany in this trade.

## PRODUCTION OF PLANT ESSENCES.

The *Bulletin of the International Institute* of Agriculture says :—

The resumption on a large scale, after the war, of the manufacture of scented soap and perfumes, will make the production of plant essences very important. The plants that produce these essential oils in the Dutch East Indies are wild or cultivated.

Among the wild species may be mentioned the "cajuput" from which is obtained cajuput oil by distilling the leaves. Adulteration with paraffin, benzine, etc., is all the more common as it is not easily detected; adulteration may, however, be detected by violently shaking a bottle half filled with the oil ; the air bubbles produced vanish at once in the pure liquid, remaining, however, for some time in the adulterated product. The green colour of the oil is due to the presence of copper and chlorophyll compounds; this is why a small piece of copper is often added to the product. Cajuput oil is much used in therapeutics. It is mostly exported to Singapore, the chief market of the product for British India. It is also sent to the United States where it is used in making a number of proprietary pharmaceutical products.Good quantities are also bought by Siam, Hongkong and Timor Island : in Europe, the chief buyers are Great Britain, Holland and Germany. In 1913, 1914 and 1915 the total exports were 124,228, 65,469 and 79,863 kg. At present there is a tendency for eucalyptus oil to replace this product.

The species cultivated occupy an area of about 3,000 hectares, 2,700 of which are in Java alone. They are often found with other crops on large estates. The chief essential oils furnished by these species are given below :

Citronella oil is obtained by distilling "serchwangi-grass" a grass mostly cultivated by the natives ; 1,000 kg. of the grass yield about 7 kg. of the oil, which is mostly used in soap and perfume making (synthetic essence of roses). The chief producing countries are Ceylon and Java ; Java produces by far the smaller quantity, but the product is of better quality and fetches twice the price of the other. The exportation of Japanese citronella oil to all countries was:—1913, 75,330 kg. ; 1914, 136,654 kg. ; 1915, 234,326 kg. ; 1916, 428,743 kg. ; 1917, 515,763 kg. The largest importers are the United Kingdom, the United States and Japan.

*Lemon-grass Oil.*—Produced from the grass of the same name, the yield being 0·2 per cent. Importers prefer the oil from Cochin China and Reunion.

*Cananga Oil.*—Obtained by distilling the fresh flowers of the cananga, a tree that usually flowers twice a year, giving 60 kg. of flowers; to obtain 1 kg. of oil requires at least 350 kg. of flowers. This product is exported in small quantities ; not mentioned in official statistics ; it has to compete with ylang-ylong oil from the Philippines, which costs 10 times as much.

*Champaca Oil.*—Obtained from the roots of the vetiver or cuscos grass ; the roots contain from 0·4 to 0·9 per cent of essential oil ; no official statistics as to its exportation are available.

*Patchouly Oil.*—Is obtained by distilling the stems and leaves of *Pagostemon Patchouly* Pell. The leaves can be gathered repeatedly, at intervals of six months. The east coast of Sumatra furnishes most of the supply.

*Geranium Oil.*—Is obtained by distilling the leaves of *Pelargonium* spp., the essential oil of which much resembles that of the rose. It is widely cultivated, especially in rubber plantations. During some researches it was found that seventy-one plants gave 76·5 kg. of leaves, which produces 53 cc. of essential oil containing as much as 58·8 per cent of geraniol.

## THE COMPOSITION OF THE SOIL.

### Simple fact Regarding its Chemistry.

The *South African Sugar Journal* in an interesting article on the composition of the soil says:—

Considering what an important part the soil plays in the life of the farm, it is surprising how few know much about its structure. There is no reason why this should be neglected, for the soil presents a most interesting study, and one which should be at all times profitable. It may be advanced that few have the opportunities owing to the pressing nature of their work to undertake studies of this kind, which is true enough as far as it goes, but if it results in an improved knowledge and better yields, and, consequently more money, it will be admitted that nobody can afford to neglect such investigations.

If any soil be examined that has not been disturbed by tillage operations, it will be seen to be composed of layers which are always in the same order, no matter what soil it is or where it may be. The best place in which to make an examination of a soil, is in a railway cutting, or a donga, or in any place where there is a deep opening between two portions. An examination of such a section will reveal a grass

or vegetable layer about three inches deep at the top, which is generally called turf. Below this is a layer of the soil proper ranging from a few inches to a few feet or more in depth.

Below this again, in some cases, is what is called the subsoil. There are cases in which there is no subsoil at all, but on the other hand the subsoil may extend downwards to a great depth. The subsoil can be distinguished from the soil and turf by the fact of its being lighter in colour. Sometimes, in the lower portions of the subsoil, or where the subsoil is absent, immediately below the soil proper, we find rubble or broken rock mixed up with the earth. Underlying the whole is the solid rock from which the overlying soil has been formed.

There are *the structural divisions of a soil.* They do not all exist in every soil, but when they do occur they are always in the same order. Sometimes while the different divisions can be seen, it is impossible to find any actual line of separation between them.

Next we come to the composition of a soil, or the ingredients of which it is composed. There are five of these: *viz.*, stones, sand, clay, lime and humus. It is on the preparation of these constituent parts that the farmer bases his opinion of the value of a soil, so far as its mechanical condition is concerned, for agricultural purposes. It forms, in fact, the basis of classification of soils for the purposes of classification and description.

VARIETIES OF SOILS.

There are endless varieties of soils, but every soil can be included in one or other of the following seven classes: (1) Sandy, (2) Loamy, (3) Clayey, (4) Marly, (5) Calcareous (*i.e.* chalky), (6) Gravelly, (7) Humus.

The description of a soil depends upon the relative proportions of its five proximate constituents. For instance, if humus predominates, we call it a humus or peaty soil; if sand is a large constituent we term it a sandy soil. It is scarcely necessary to point out that it is impossible to give hard-and-fast percentages of constituents for each class of soil, but we can decide upon approximate proportions which will assist us in classifying soils that come under our observation.

If the planter in the course of his wanderings will test his knowledge by estimating the character of the soil, he will find the information gained valuable, and the practice in differentiating between them very helpful.

The following percentages will be useful as representing the limits of each class: Sandy soil should contain over 90 per cent of sand. Sandy loam should contain from 80 to 90 per cent of sand. Loamy soil contains from 70 to 80 per cent of sand. Clayey loam contains from 20 to 50 per cent of clay. Clayey soil contains over 50 per cent of clay. Marly soil contains from 5 to 20 per cent of lime. Humus soil contains over 5 per cent of organic matter. These facts are worth storing up, so that when a certain treatment is recommended for a certain soil, a farmer may see at once what it is composed of.

CLAYS.

Clay comprises the sticky, plastic part of the soil. When there is too much of it, the soil is heavy. Every fertile soil must contain lime, even if only in a small proportion. Limes make stiff soils, such as clayey ones, more crumbly and friable, and is therefore added to improve the soil.

HUMUS.

Humus is the animal and vegetable matter, which decaying, have accumulated in the soil and mixed with the mineral constituents. All fertile soils contain some humus. The terms organic and inorganic are often used in relation to the soils, and there must be many times when they puzzle the farmer striving to understand what he is reading about. The meaning of such terms can be impressed upon the mind by a very simple experiment:—

Suppose one were to take a quantity of dry soil on a shovel and heat it over a fire to a red heat, part of the soil would burn away, while a portion would remain in the shovel unaffected by the heat. The part which burns away would be the organic part, and the portion remaining, the inorganic.

The proportion burnt away in any soil would depend upon the amount of humus, or decayed organic matter present in the soil. In a peaty soil there is sometimes as much as 90 per cent of humus, so that if a sample of such soil were burned by far the greater part of it would disappear into the air, leaving a relatively small amount of inorganic or mineral matter.

The part that disappears in the burning consists of carbon, hydrogen, oxygen, and nitrogen.

These facts are but the A B C of soil chemistry, but the knowledge of them may prevent many mistakes being made, and induce better farming practice.

## BAMBOO AREAS IN BURMA SUITABLE FOR PAPER PULP MANUFACTURE.

-The *Indian Trade Journal* for June 27, publishes (1) extracts from a Note, dated 2nd February, 1919, by Mr. W. Raitt, F.C.S., Consulting Cellulose Expert to the Government of India, on certain bamboo areas in Burma recently examined with a view to utilization for the manufacture of paper pulp, and (2) a similar Note, dated 30th April, 1919, on an area in the Thayetmyo District by Mr. J. D. Hamilton, Extra Assistant Conservator of Forests. The Government of Burma (Forest Department), to whom it is indebted for the two Notes, accepts no responsibility for the opinions expressed by Messrs. Raitt and Hamilton but thinks that the information contained in the Notes may be of interest to firms which are considering the possibilities of the paper pulp industry :—

I

*Note on certain Bamboo Areas in Burma recently examined with a view to their Utilization for the Manufacture of Paper-pulp, by Mr. W. Raitt, F. C. S.*

THE KABAUNG AREA NEAR TOUNGOO.

There is plenty of bamboo but the Kabaung is a bad rafting river and it connects with the Sittang which is equally unreliable as a means of transport for pulp in boats to a port. A factory site at Sinseik on the Kabaung would be satisfactory as regards water-supply and a somewhat expensive siding could connect it with the main line of railway which would have to be depended on for transport of product to Rangoon but the business will not stand the cost of rail transport. Lime also is a difficulty—there is some in the hills to the east but the samples of it I have seen are poor in quality and difficult to burn and it would have to be transported in carts some fifteen miles. The alternative is Zibingyi lime from the Maymyo extension line and this also involves a long railway carriage. I do not think this area is of much account at present or until all the more suitable locations have been taken up.

MOULMEIN.

The areas on the Ataran river promise well. The river is tidal to well into the forests and the short tributary streams above tidal influences can be used for small rafts during the wet season, these being collected at the junctions with main river and sent down it in large rafts at any time throughout the year to a factory site which could be placed well down the river for it contains fresh water at high tide for a considerable distance down. From such site the product can easily be barged to steamers at Moulmein. The transport facilities are therefore good. There is, however, some doubt about the sufficiency of bamboo. In considering this I am providing for a probable expansion of factory output from 10,000 tons per annum now to 40,000 tons in the future. The forests are not typical bamboo country. There are no large solid blocks of bamboo; it occurs in patches but these patches are frequent and I think will be found sufficient considering the large total area (178 square miles including Dali) of the reserves. *Limestone* exists in large amount in the rock outcrops bordering the Ataran which in several places are on the river banks. It is not, I think, of first class quality but probably good enough. Better stone can be brought if necessary from Pa-an on the Salween forty miles up by boat at a sufficiently low cost. *Fuel* will be somewhat expensive about Rs. 6 per dry ton delivered at factory. It would be advisable to allot a fuel reserve to any factory operating here when the cost would probably be somewhat reduced. It is possible to import Bengal coal at a cost which may not exceed Rs. 15 at factory which is equal to about Rs. 5 per ton for wood and this makes a reserve to fall back on should wood fuel prove a difficulty in the future. Export facilities from Moulmein are good as the port is open all the year round. Local labour is available in the forests from January to April.

SALWEEN.

I went up as far as Shwegon but no small launch could be got to go higher. Visited the Pa-an limestone quarries. From what I could learn of the bamboo on the Yunzalin tributary I do not think there is enough of it for a factory supply and there appears to be no other within reach. Considering that there is a certain amount of doubt about the Ataran supply, I think it would be wise to reserve the Yunzalin as an auxiliary area to the Ataran. The Gyaing river bamboo areas are no use. I did not think the *Sittang* was worth visiting. Above the Pegu canal, which provides communication with the Irrawaddy and Rangoon, it may be useful, but the Sittang mouth is bad at all times of the year for navigation and impossible during the monsoon.

AKYAB AND KALADAN RIVER.

Good prospects here. The river is as good if no better than the Ataran and a factory site can be got

some twenty miles above Akyab where the water is fresh. Akyab is an open port all the year round. Bamboo exists in very large quantities close to tidal water on the main river and its tributaries. Its cost *per dry ton* is however more than on the Atarain. The species existing (*Melocanna*) is very light and since costs depend mainly on the number cut and not on their dry weight the dry ton cost works out higher than elsewhere. Still it is not too high. The short flowering cycle of this species—about fourteen years I understand—introduces an element of uncertainty but against this the period of recovery is only four years and flowering is not simultaneous or general all over the division; it proceeds slowly over a period of about seven years; consequently the areas which have first flowered have reached the full crop stage before later areas commence. I think this characteristic makes it safe but it does of course increase the total area required by a factory. *Limestone* of good quality can be brought by boat from Ramree island some sixty miles down the coast from Akyab. *Firewood* exists in large quantities close to the proposed factory sites. *Forest labour* supply is good.

II.

*Note on Bamboo area suitable for paper pulp manufacture in the Thayetmyo District by Mr. J. D. Hamilton.*

*Locality.*—The area lies roughly between the following boundries.

N. Southern watershed of the Mindon River.
S. Thayetmyo District boundary.
E. Irrawaddy River.
W. Foot of Arakan Yoma Range.

The total area may be taken to be at least 400 sq. miles. The bamboos are largely concentrated in the drainage of the Made Chaung and in many places come right down to the banks of the Irrawaddy River. The Made Chaung comes out at Kama a small town on the Irrawaddy River about twenty miles above Prome. The I. F. Company steamers call at Kama. A Pulp Factory would be best put up somewhere in this vicinity. But even Prome is not too far away and being at a railhead may offer some special attractions.

*Species.*—The bamboo referred to in this note is Dendocalamus strictus, Bur. Hmyinwa—sometimes called the male bamboo owing to its generally yielding more or less solid stems. But all hmyinwa stems are by no means solid and when the bamboo is hollow the walls are usually very thin. But as the area in question is taken to contain sufficient solid culms to meet factory requirements it is as well to say so with an expressed knowledge of the above peculiarity.

*Supply available.*—About nine million bamboos are cut annually from this area for trade purposes, *i.e.*, the forest department collects royalty on this number. It can be safely said that there would be no difficulty in procuring a further twelve million especially as the pulp trade would not trouble about the straightness of culms. As the solid stems are usually not so straight as the hollow the area really has a large and easier supply of the former. This means of course great economy. The weight of 18 ft. long *dry* bamboos of average thickness I find to be 8 lbs. 280 bamboos would thus go to a ton and 12,000,000 bamboos would give 40,000 tons. Mr. Raitt expresses a doubt as to the possibility of procuring this amount in Moulmein. The Thayetmyo area is free from this doubt.

The cost of extraction of the bamboos to the factory would be about Rs. 8 per ton reckoning dry weight. In the green or semi-green state it would be much less.

*Flowering.*—So far as I know the Hmyinwa bamboo does not flower in the same universal manner as other species. The flowering is sporadic, and the bamboo always seems to be in flower in patches—more so perhaps in some years than in others. Seed is thus nearly always available. So that if the intensive cutting of culm showed signs of any area being in danger of depletion it would always be resown by simply scattering seed collected from some other locality. As a safeguard it would be a much less irksome method than requiring firms to cut only a certain number of culm from each clump. A method so full of difficulties as to be hardly practicable.

*Fuel.*—Firewood is plentiful and would cost about Rs. 5 per dry ton delivered at the factory, *i.e.* assuming the factory would be somewhere near Kama.

In the Made valley there is also coal of much the same quality as that recently tried on the Burma Railways. This coal could to some extent be brought down on bamboo rafts. I have not examined the extent of the coal bearing area and merely mention a possibility which may prove valuable.

*Lime*—Great quantities of lime are available from Tondaung and Pelthalin villages a few miles below Thayetmo. It is at present manufactured at both these villages. It is derived from a Nummulitic limestone of excellent quality.

*Fresh water-supply.*—The Irrawaddy River.

*Sulphuric acid.*—There are large deposits of iron pyrities not far from Kama. That at the surface is not rich in sulphur. But being on the spot it would be worth examining.

*Facilities of exports*—The pulp could be taken in cargo boats to Rangoon or Bassein for shipment either by the I. F. Co. or private arrangement.

## THE MANUFACTURE OF CALCIUM CARBIDE, CALCIUM CYANAMIDE AND CYANIDES IN INDIA.

The Indian Munitions Board *Industrial Hand-book*, 1919, (revised edition), just published, contains an interesting note on the manufacture of Calcium Carbide, Calcium Cyanamide and Cyanides in India by Dr. L. L. Fermor, Geological Survey of India. The Note concludes with the following summary :—

The foregoing note is the result of a preliminary investigation into the possibilities of manufacture in India of calcium carbide, calcium cyanamide, and sodium cyanide. Lack of detailed information prevents the setting forth of a definite scheme showing costs and possible profits, except in the very approximate manner attempted at the end of this summary. But such figures as are available suggest that there would be a considerable margin of profit on the manufacture of calcium carbide in India, in consequence of which it would probably pay to manufacture not only all the carbide required in India, but also other products manfactured from carbide, namely, the impure calcium cyanamide known commercially as nitrolim, and sodium cyanide. It is thought, however, that the Indian consumption of these materials may not be sufficient to justify the installation of an economic unit of plant. Consequently, the proposal is made that the plant should be designed to produce 6,000 tons of carbide annually, which would be disposed of as follows* :—

*6,000 tons calcium carbide—*

- 1,000 tons for sale in India.
- 1,000 tons for sale in Eastern Markets.
- 4,000 tons for transference to the cyanamide factory yielding 5,000 tons nitrolim to be utilized as follows :—

*5,000 tons nitrolim—*

- 4,600 tons for sale as manure in India, Ceylon, Java, Sumatra, etc.

400 tons for conversion to sodium cyanide.

Four possible sites for such an industry are mentioned, two using electric power generated from Mond gas, and two using hydro-electric power. The site selected for investigation is Burhar in Rewa State. The production here of 6,000 tons of carbide annually by the use of electric power generated from Mond gas with recovery of ammonia as sulphate, would require :—

| | £ |
|---|---|
| *Electric energy—* | |
| 4,000 k. w. yrs. at £4·75 per k. w. yr. (from 24,000 tons low-grade coal) ... | 19,000 |
| *For production of carbide—* | |
| 5,800 tons of first class coal at Rs. 6-8-0. | 2,513 |
| 4,711 tons of lime at Rs. 13-0-0 ... | 4,083 |
| 180 tons of electrode corbons at £15 ... | 2,700 |
| *For production af cyanamide—* | |
| 1,750 tons of liquid nitrogen—cost of production not known—original value *Nil* ... | |
| *For production of cyanide—* | £ |
| 431 tons of salt (duty free) at £1·5 approximately ... | 647 |
| Total ... | 28,943 |

The quantity and approximate value of the products, annually, would be—

| | £ |
|---|---|
| 2,000 tons of calcium carbide (80 per cent $CaC^2$) at £13·5 ... | 27,000 |
| 4,600 nitrolim (20·22 per cent N) at £12·2. ... | 56,120 |
| 825 tons sodium cyanide mixture = 250 tons NaCN at £70 ... | 70,500 |
| Total value of products ... | 100,620 |

Above it was estimated very roughly that the power and carbide sections of the scheme would cost £134,000. It is very difficult to obtain reliable information on such matters, but from a careful analysis of the very imperfect data available, it seems likely that the capital outlay on the cyanamide and cyanide plants would be about £50,000 and £5,000, respectively. The total capital outlay required for the whole scheme would then be—

| | £ |
|---|---|
| Power plant ... | 101,000 |
| Carbide plant ... | 30,000 |
| Cyanamide plant ... | 50,000 |
| Cyanide plant ... | 5,000 |
| Total ... | 189,000 |

*Judging from information received since this note was written, the scale of operations suggested is too small and should be at least twice as extensive. This would mean a greater reliance on export to commence with.

*The estimates of capital costs are presumed to be on a pre-war basis.

On this basis the annual outlay would be roughly—

| | | £ |
|---|---|---|
| Cost of energy | ... | 19,000 |
| Cost of materials | ... | 9,943 |
| Labour and administration | ... | 12,000 |
| Depreciation at 10 per cent on £85,000. | | 8,500 |
| Repairs and renewals at 3 per cent on £85,000 | ... | 2,550 |
| Packing in drums 2,000 tons of carbide and 825 tons of cyanide mixture at £1·5 per ton | ... | 4,238 |
| Packing in bags 4,600 tons of nitrolim £0·5 per ton | ... | 2,300 |
| Loss in dust (carbide, | ... | 1,050 |
| – Total expenditure | ... | 59,581 |

| | | £ |
|---|---|---|
| Value of products | ... | 100,620 |
| Therefore, profits | ... | 41,039 |
| To this must be added 5 per cent interest on capital cost of power plant (£104,000) included in cost of power | | 5,200 |
| Total profit | ... | 46,239 |

The above figures show a profit of 48 per cent on the capital cost of the chemical plant alone, or of 24 per cent on the total cost of chemical and power plant. The data on which this estimate is based are admittedly inadequate, but the figures are probably approximately of the right order, and the amount of profit shown leaves an ample margin for such charges as interest on cost of acquisition of land, for increased cost should this enterprise be undertaken under abnormal conditions, or for decrease in the value of the products after the war should there be cutting of prices due to over production in Europe. The figures, however, are sufficiently encouraging to show that the scheme outlined in this note is worthy of serious investigation by duly qualified people.

In this note no consideration has been given to the further industries depend upon nitrolim or calcium cyanamide as raw material, *viz.*, the manufacture of ammonia from cyanamide, with conversion into ammonium sulphate, nitrate or phosphate for use as fertilizers, and the further oxidation of ammonia to nitric acid by one of the Ostwald group of processes for the provision of the nitric acid required in such large quantities in the manufacture of explosives, amongst which ammonium nitrate may be mentioned.

Before any such scheme as that outlined in this note can be carried out, very careful consideration will have to be given the competitive effects of ammonium sulphate obtained as by-product from coke ovens, and *via* the Haber process.

It is only necessary to make a passing reference to the industries dependent upon cheap supplies of acetylene derivable from calcium carbide, such as the manufacture of acetic acid and acetone, and the use of the oxy-acetylene flame for welding, liquid oxygen suitable for this purpose being obtained as a by-product in the manufacture of calcium cyanamide.

Should the scheme here outlined be subsequently supplemented by the plant necessary for the production of ammonia and nitric acid, we should be providing India with a very desirable Janus-like or double-faced scheme capable of providing fertilizers in times of peace and explosives in times of war.

The extent of the Indian consumption of the several materials may be judged from the following tables embodied in the note :—

*Table 1.—Imports of calcium carbide from 1912 to 1918.*

| Year | | Quantity | Value | Value per ton |
|---|---|---|---|---|
| | | Tons. | £ | £ |
| 1912-13 | ... | 685 | 10,131 | 14·79 |
| 1913-14 | ... | 1,000 | 15,474 | 14·47 |
| 1914-15 | ... | 874 | 12,749 | 14·59 |
| 1915-16 | ... | 1,118 | 18,117 | 16·20 |
| 1916-17 | ... | 888 | 23,716 | 26·70 |
| 1917-18 | ... | 642 | 24,682 | 38·44 |

*Table 2.—Imports of potassium cyanide from 1912 to 1918.*

| Year | | Quantity | Value | Value per ton |
|---|---|---|---|---|
| | | Tons | £ | £ |
| 1912-13 | ... | 283 | 24,917 | 88·04 |
| 1913-14 | ... | 264 | 22,730 | 86·10 |
| 1914-15 | ... | 207 | 18,151 | 87·68 |
| 1915-16 | ... | 50 | 5,021 | 100·42 |
| 1916-17 | ... | 54 | 5,938 | 109·96 |
| 1917-18 | ... | 2 | 593 | 296·36 |

*Table 3.—Imports of sodium cyanide into India (excluding Calcutta) from 1913 to 1917.*

| Year | Quantity | Value | Value per ton |
|---|---|---|---|
| | tons | £ | £ |
| 1913-14 ... | 21 | 1,821 | 86·74 |
| 1914-15 ... | 55 | 5,141 | 93·47 |
| 1915-16 ... | 385 | 36,939 | 95·90 |
| 1916-17 ... | 401 | 41,478 | 103·43 |

*Table 4.—Imports of calcium cyanamide of India since 1912.*

| Year | Quantity | Remarks |
|---|---|---|
| | Tons | |
| 1912 ... | 135 | The average sale price before or in the beginning of the war f. o. r. Calcutta was £13·33. |
| 1913 ... | 170 | |
| 1914 ... | 275 | |
| 1915 ... | 1,400 | |
| 1916 ... | 200 | |
| 1917 ... | ... | |

*Figures kindly supplied by Shaw, Wallace and Company Calcutta.

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## INDIAN TEA SEEDS AS A SOURCE OF OIL.

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The following article appears in the current number of the *Bulletin of the Imperial Institute*, London :—

A sample of Indian tea seed (*Camellia Thea*) was forwarded by the Chief Scientific Officer of the Indian Tea Association in September, 1917, at the suggestion of the Imperial Institute, in order that the yield and character of the oil it contains might be ascertained in comparison with that obtained from *Camellia Sasanqua* seed, the usual source of commercial tea-seed oil from China.

The sample was described as Assam Kharikatia tea seed from the Jorehaut Tea Company. It consisted of dark greyish-brown seeds, which were mostly spherical and measured from $\frac{1}{2}$ to $\frac{5}{8}$ in. in diameter. The shell was rather less than $\frac{1}{32}$ in. in thickness.

The kernels, which were wholly or partly covered with a thin, wrinkled, brown skin, were spherical in shape, hard and yellow, and could be easily split into halves.

The seed consisted of kernel 58 per cent and shell 42 per cent.

The air-dry kernels contained 10·4 per cent of moisture and yielded 17·3 per cent of clear golden-yellow liquid oil, with a slight, not unpleasant taste and smell. This yield is equivalent to 19·2 per cent of oil from the dry kernels.

The oil extracted from the kernels with slight petroleum was submitted to chemical examination with the following results, compared with those recorded for the oil from *C. Sasanqua* seed from China examined at the Imperial Institute.

| —— | Present sample of *C. Thea* oil | *C. Sasanqua oil* |
|---|---|---|
| Specific gravity at $\frac{15°C.}{15°C.}$ ... | 0·921 | 0·918 |
| Solidifying point of fatty acids | 32·8° C. | ... |
| Acid value[1] ... ... | 3·6 | 9·4 |
| Saponification value[1] ... | 194·2 | 193·4 |
| Iodine value ... per cent | 93·2 | 87·5 |
| Hehner value ... ... | 95·2 | ... |
| Insoluble fatty acids per cent | 93·7 | ... |
| Unsaponifiable matter do | 1·5 | ... |
| Volatile acids, soluble ... | 0·14 | ... |
| ,, ,, insoluble ... | 0·16 | ... |

[1] Milligrams of potash for 1 gram of oil.

The oil furnished by this Indian seed is of the "non-drying" class and resembles the tea-seed oil of commerce derived from *C. Sasanqua*. There is no doubt that the Indian oil would be readily saleable if it could be produced in commercial quantities.

The amount of oil contained in the kernels is low, *viz.*, 17·3 per cent as compared with 58 to 59 per cent in *Sasanqua* kernels. Seeds of kernels containing such a low percentage of oil as the Indian tea-seed kernels are usually not of commercial

portance as sources of oil unless the residual cake s a high value as a feeding-stuff or for some other rpose. Tea-seed cake contains saponin, and is erefore not suitable for uses as a cattle food. The ninese tea-seed cake has been principally employed r the manufacture of worm-killing preparations r use in horticulture, and for this purpose was ered at about £8 10s. per ton *c.i.f.* London before e war. The cake from the Indian tea-seed could *utilised for the same purpose.*

The small yield of oil from the Indian tea-seed and e comparatively low value of the residual cake nder it unlikely that the seed could be remunera-ely employed as a source of oil. Only in the event large supplies of the seed being available at a low ice does it seem probable that the extraction of the on a commercial scale could be recommended. would not be remunerative to export the seed or rnels and the oil would therefore have to be ex-cted in India.

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## INDIAN TRADE IN RUSSIAN CENTRAL ASIA.

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It is reported that there are bright pros-cts for the development of British trade in ıssian Central Asia, Trans-Caspia and the untries contiguous to the Black Sea, not to ention territories east of the Caspian and e Syr Daria.

Trade in Russia has long been at a standstill, but th a return to normal conditions there is sure to a trade boom. The disturbed condition of the ıntry precludes any precise estimate being made the future value of the Russian market for Indian duce, but its potentialities should certainly be nsidered by Indian merchants. Pre-war statistics w a decided partiality for Indian goods and this dency will be revived with the establishment of a ble Government in Russia. The war has produced ite economic conditions in that country, and with m has arisen the need for development of Russian ustries, ways and communications, for which such ducts as jute, rubber, oilseeds, tanning materials, , will be required, in addition to foodstuffs such ea, coffee, rice, spices and other articles. There is now a shortage in Russia of all commodities usu-ally imported, and an abnormal accumulation of savings which mean potential purchasing power in the hands of a class where spare funds are usually low. Seeing that the products are of daily use to large classes the demand for such articles must in-crease when order is restored.

In view of competition it should be to India's advantage to take possession of what promises to be a large and lucrative market in Russia and Russian Central Asia.

Russian merchants who appropriate the possibili-ties of Indian trade advise organization and co-opera-tive effort and deprecate merely individual attempts.

As far as routes are concerned for this trade those *via* the Black Sea, Vladivostock and the Siberian Railway, and to a limited extent the Ladakh-Yarl and road, would appear to be the best.

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## AGRICULTURAL EDUCATION IN THE CENTRAL PROVINCES.

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Mr. D. Clouston, M.A., B.Sc., Director of Agriculture, Central Provinces, Nagpur, writes in the *Agriculture and Co-operative Gazette* :—

The two Agricultural Middle Schools to be opened this month at Chandkhuri and Powarkhera mark the beginning of what promises to be a new era of agri-culture in the Central Provinces. By working through the more enterprising adult farmers the Agricultural Department has made rapid progress within recent years in stimulating their practical interest in its teaching. Millions of pounds of im-proved seed are now being supplied annually from seed and demonstration farms managed by Tahsil Agricultural Associations and Co-operative Unions, the members of which have been induced to co-ope-rative for the common weal. A keen demand for new manures and improved implements has arisen; and the silent, plodding tiller of the soil is now beginning to realize, as he never did before, the enormous possibilities there are of increasing his farming profits by adopting the improved methods of cultivation recommended by the Department.

The success achieved in these Provinces in helping the ryot to help himself has been largely due to what I may call the object-lesson system employed of de-monstrating improved methods of husbandry. These

methods have been demonstrated to him in his own village and on his own land. Hundreds of seed and demonstration farms scattered throughout the Provinces have served their purpose as object lessons of the best kind, run as they are by the cultivators themselves working under the advice and guidance of the Department. The ryots of Chattisgarh, though the most backward in the Provinces, are now raising profitable crops of cane, cotton and groundnut on poor lateritic soils, locally known as *bhata*, because the Department has shown them how to. These waste *bhata* lands, which have for ages produced only a very inferior crop of speargrass, are now being regarded as the most valuable in the Division, and their value within the last three years has increased tenfold in consequence. The enterprising ryots of the cotton tract are now growing nearly a million acres of that very prolific and profitable variety of cotton known as *Roseum*, because the Department has convinced them that it is the best they have ever tried. In the wheat tract of the north of the Provinces many thousands of acres are now cropped with improved strains of wheat and *til*. We may fairly claim, therefore, that the interest of the cultivators of the Provinces in improved agriculture has been stimulated, and that the way for further progress has been prepared.

As a result of the teaching of the Department the more intelligent landholders are now beginning to demand for their sons an education that will give them power to understand and to apply effectively the results of the experimental and research work carried out for them by the AriculturaI experts of the Department. They are beginning to realize, too, that the literary system of education given in their rural schools at present does not fit their boys for their life's work as farmers. Influenced by these considerations the Chief Commissioner, Sir Benjamin Robertson, attaches the very greatest importance to the opening of these Agricultural Middle Schools on Government Farms.

These schools are primarily intended for the sons of the landed aristocracy of the Provinces; they will be the training centres for the farmers of the future. Their aim will be to give a good liberal education combined with a training in the principles and practice of improved agriculture. The sons of *bona fide* landowners, between the ages of 14 and 18, who have passed the Upper Primary School, are to be admitted. On the staff there will be two teachers, both of whom have been trained at the Agricultural College, Nagpur, and one of whom has also been trained in pedagogy. For each school a well furnished hostel, a reading room, library, museum, and a play-ground where the boys will play hockey, football and other games in thier spare time, have been provided.

To give the teaching a practical bent each school will have an area of 30 acres, which the boys themselves will cultivate on improved lines. This training in actual farm-work will, it is hoped, make them good, practical, self-reliant farmers, and give them at the same time a true sense of the dignity of labour.

One of the great difficulties which the Department has to face in opening schools of this kind is the want of agricultural literature suitable for boys; but steps have already been taken to supply this want. An Agricultural Reader and a Book "Lessons on Indian Agriculture" have already been written and are now in the Press; the latter book contains lessons on the history of agriculture, on soils, tillage, manures, plant-life, farm-stock, dairying, insect pests and agricultural co-operation. The lessons are beautifully illustrated and have been written in simple language and with a definite object in view, namely, to interest the reader in different phases of rural economy. The aim of both books is to idealize rural life, for, if we give the sons of the soil a vision of something better than they have known in the past, their occupation becomes attractive and more worthy of their attention.

It is hoped that these Agricultural Middle Schools will in course of time develop into Agricultural High Schools which will send students to the Agricultural College, Nagpur, for a still more advanced course in the science of agriculture. Such schools should go far to make our future farmers take a more intelligent interest in their life's work to attract to this noble profession the best brains of rural areas, and to raise the standard of life and comfort in our villages.

# SPEECHES AND PRONOUNCEMENTS.

## INDIAN INDUSTRIES IN PARLIAMENT.

In the course of the Indian Budget Debate, in the House of Commons on the 22nd May last Dr. E. Hopkinson said :—

I hope the House will extend to me the indulgence it usually extends to a Member addressing it for the first time. Perhaps I have some excuse for taking part in the Debate, seeing that I am the only Member of the House who is also a member of the Indian Industrial Commission. There was one statement made by the Secretary of State this afternoon which will give the utmost satisfaction not only in this House but also in India. It was that the labours of that Commission are not to be set aside or lost sight of, but that the recommendations and the Report of the Commission will be fully considered now that the chairman, Sir Thomas Holland, is in this country. If there was one thing more than another which became abundantly clear during the investigations of that Commission it was the deep interest taken by the Indians themselves in the improvement of the industrial position of India. The Commission had unusually good opportunities of ascertaining not only the physical possibility of increasing the industrial wealth and improving position of the country, but also the attitude of the Indians themselves towards those ends. We had as our President Sir Thomas Holland, a man of great ability, who knew India, perhaps, better from the point of view of the natural resources of the country than anyone else. He had himself served in the Government of India, and had brought the Geological Department of the Government of India to a degree of efficiency second to none in the world. We had also on the Commission four Indian members, three of them great leaders of industry in India, and the fourth a politician pure and simple—I will not say with no interest, but with comparatively little intelligent or instructive interest in the industries of India. We had also on the Commission two or three members of the Civil Service of India, and myself, of whom it cannot, at any rate, be said that I was tinged with any preconceived notions from the Indian point of view.

I do not desire to weary the House by referring in detail to the findings of the Commission and the recommendations contained in their report, but I would like to refer to some of the most vivid and vital impressions which resulted from our investigations. No more striking impression was made upon the minds of all of us, even those who knew India well, than the enormous potential wealth of the country. Though the wealth is there, burried in the soil or ready to be extracted from the soil by the natural processes of agriculture, it is scarcely developed compared with what it might be. The reason is not far to seek. Let me cite agriculture, first of all, as an example. because it perhaps more clearly than any other branch of industry shows what might be done compared with what has been done. The wealth of India is primarily due to its agriculture. The Government of India has a scientific agricultural staff in quality second to none in the world, but in quantity ludicrously insufficient compared with the problem which it has to tackle. It is the third country in the world in the extent of its production of wheat and barley, but where the production of wheat and barley is represented by twenty per acre in England, *in India it is only represented by eight. It does not* seem to me a very great thing to suppose that by the application of scientific methods and research that figure of eight might be changed into ten, and that would mean millions sterling to India. Take another illustration. India produces more sugar than any other country in the world, but the consumption is so great and the methods so wasteful that it actually spends ten million sterling annually on importing the sugar that other countries produce. Let me take one other instance in connection with agriculture. I think it is the most striking of all. Before the invention of synthetic indigo by the Germans, the cultivation of indigo was one of the most flourishing industries in India. We are aware how by patient and scientific research, and the expenditure of money yearly upon research, the Germans displaced the natural indigo of India by the synthetic product. The trade was absolutely killed. During the War there was a revival of the industry, and that revival was brought about by a series of investigations in regard to the preparation of the natural product. It was given in evidence before the Commission by one of the most experienced planters in Behar that he would undertake to grow indigo now on his plantation, taking advantage of all improvements, and to sell it at prewar prices at a profit. That means, and I wish the House to take cognisance of the fact, that the pre-war German trade in indigo could be killed outright on its merits. Is not that a striking fact? Does it not make it worth while that the recommendations of the Committee should receive serious consideration at the hands of the Government of India and of the right hon. Gentleman the Secretary of State? Before I pass from agricultural questions, I want to emphasise the need that the scientific department of the Agricultural Department in India should have more money spent

upon it, and that it should be enlarged. What is required is that brains should go out from this *country to help in the scientific work.* Reference has been made by one of my hon. Friends to the supply of tungsten. That is a trade which before the War had passed entirely into German hands. Under the pressure of war it has come back into British hands. India could produce all the tungsten the world requires, and all that is needed is practical development of the trade. There is another metal, thorium a most important metal, one essential for the production of gasses. The trade in that, too, was allowed to pass into German hands. This country, by availing itself of its opportunities in India, could now become self-supporting in that regard. India possesses copper. The mines in Burma produce lead and zinc, and if there were only a concentration camp it would be possible to obtain sulphuric acid, which is a basis of many very important industries.

Even that feature of the situation has a brighter side. Thanks to the assistance and sympathy of a Liberal Government on the scientific side, and not much of that, although the intention was really good, a great Tartar firm were induced to set up iron and steel works which have become one of the most flourishing and most important works in the world. India now can supply all the rails she wants, and before long she will be able to supply our own needs. That has been done entirely by native effort and with native capital, but it was done with the sympathy and help and the scientific advice of the Government of India. That is one of the fundamental things which the Commission desire to see extended and developed throughout India. The Government should provide scientific help for research work, which is necessary for the development of the country industrially, and should also by sympathy expressed in various ways—it may be in improved transit or by help in the acquisition of land—I could suggest a dozen different ways—aid the development of industrial India. Let me relate one instance to the House to show the attitude of India itself towards *this aspect of the question. An Indian witness* before the Commission made what appeared to me to be a curious statement. He said the Government of India should pass a law providing that half the directorate of every company should be Indian. It appeared to me that that might be due to jealousy of British industrial methods in India, but on examination I found that it was not so. The real idea was that Indians should be taught how to work and manage the various undertakings. It was desired to convert every board of directors into a school. The idea, of course, is ludicrous, but the statement was significant as showing the trend of the Indian mind towards industrial measures.

The manufacturing industries of India are obviously divisible into two classes—those already developed, such as the great jute industry of Bengal, the cotton industry of Bombay and to some extent the woollen industry of Cawnpore. There are a number of other industries, such as the manufacture of glass, cement and matches. There are also the chemical trade and the manufacture of paper, both of which are still undeveloped for want of technical knowledge and expert advice. What the industries of India require is not British capital, but British brains. They need expert advice, and scientific knowledge applied to the latent resources of India will bring forth a harvest of a hundredfold. But that is not the whole story. Other factors must also be taken into account. Indian labour must be considered. In the course of our inquiry we made careful investigations, not only into the remuneration of Indian labour, but into housing and sanitary conditions. If the problem of labour is acute in this country, it is ten times more acute in India. I say that advisedly. The rate of wages in India is far too low for tolerable subsistence. Industrial conditions in India in many cases, and have particularly in mind the cotton mills of Bombay, are so monstrously bad that I could hardly relate to any decent assembly of people what I myself saw in the course of my investigations. Although a Lancashire man, I greatly admire the action which the predecessor of my right hon. Friend the present Secretary of State took with regard to the cotton industry, but I do wish he had taken that opportunity *of throwing upon the Bombay mill-owners the onus* of improving the housing conditions of their work people. I believe, and I say it advisedly after conversing with a great number of the mill-owners that the best are perfectly ready to shoulder the burden if they are assured it would be distributed over the whole. And there again, is a brighter side to the picture. The new steel works of the Tartar firm to which I have already referred are in all matters of housing up-to-date in every possible respect. Each cottage has its garden, each coolie line has ample space around it, and the water supply is perfect, and yet that firm in spite of all its expenditure in that direction, is able to pay a divid end of 200 per cent.

That sort of thing cannot be done in India without cost, but the cost amply justifies itself. You may go to other places and find conditions equally good. I myself investigated the conditions in one of the largest mills in Bengal. That mill was able to make a selection of labour by drawing it from a very much larger area, simply because that firm had the reputation of supplying pure water, indeed it was

nicknamed "Mill Pure Water." Not only was the water good, but the housing conditions, the coolie lines, and the sanitary arrangements were all in first-rate condition and up to date. So much impressed was I by what I saw at the mill, that that evening, when I met the then Governor of Bengal, Lord Carmichael, who retired a year ago, I suggested to him that it would be an encouragement to mill owners if he at once made an inspection himself of that particular mill. I made the further suggestion, which he at once adopted, that he should take with him the leader of the Home Rule movement in India. Next day the Governor and the Pundit motored up to this mill to inspect the sanitary arrangements. That is an example of how the Government of India can show sympathy with, and give effective assistance, without any cost to itself, towards putting the industrial conditions on a higher level. My friend the Pundit was not at all pleased with the result of the expedition. It always troubled him to find that the British, of their own accord and with nothing to reap from it, were usually ready to put all questions relating of the health and welfare of their people in the first place.

Another no less important matter is the question of education. The educational system in India is a most extraordinary structure. It is fitted with a magnificent coping and balustrade, but it is built on sand. India is an absolutely illiterate country. Over 90 per cent, of the people can neither read nor write. India possesses magnificent universities, which turn out graduates by the thousands yearly. Take the University of Calcutta, where abuses became so great that it was made the subject of a special inquiry. What does that University do for India? It does nothing but turn out by the thousands annually persons who have been drawn off from the real interests of India and turned adrift to find a living in other directions. I asked in Indian who was giving evidence in Calcutta what became of the graduates of that University. His answer was a striking answer coming from such a source. He said, "A very few of them become pleaders; the great majority of them become clerks; and those who have not the ability or opportunity to become clerks become sedition mongers." That was the considered opinion of a practical industrial Indian of one of the universities of his own country. That problem is not insoluable. I can give an instance of another side of the picture, which I should like to put before the President of the Board of Education in this country. If you go to certain mills in Madras, there you will see elaborate comfortable, delightful, buildings, put up for school purposes. Residing in these buildings are two English ladies. The buildings are used for housing classes formed of the children of the people who work in the mills. There is no compulsion. The schools are always full. The children are absolutely free to attend or not to attend. Around the schools are gardens. Every child—the scholars are numbered by hundreds—has his plot of land which he cultivates as the desires, and he takes the product of his cultivation home to his own people. For brightness, alertness, respectableness and cleanliness, these Indian children would compare with the children of similar age in any school you like to name in this country. Yet these very mills were chosen by the political dissentients to foment strife and trouble. That was not because there was any real grievance. The reason for it was that they could not stand such an object lession of what British people have done for Indians to be always before the eyes of their people.

I am well aware that after the announcement of 20th August 1917, there can be no question of turning back from the policy which was then declared. It must go forward on lines which the Government, after the fullest consideration, determined to be the best. But I beg the Government of India and the Secretary of State to take into consideration that it is more important to feed the hungry than to give them political rights, that it is more important to clothe the naked than to invest them with political doctrines and dogmas, and that it is more important to educate the people to be able to vote than it is to give them the vote. What will be the effect of the franchise? It is estimated that the number enfranchised will be anything from 1 or 2 up to 5 per cent. The greater part of that number will be illiterate people. I presume the voters will be taken blndfold to the ballot boxes, or that, as an alternative, the ballot boxes must be embellished in some way to show what they contain or are intended to contain. I presume that one box will be embellished with the Union Jack, another with the Crescent, and another with the emblems which are familiar at every road-side shrine in India. I rejoice in what the right hon. Gentleman says of the recommendations of this Commission, which have solely for their object the improvement of the industrial conditions of India, and to make India more profitable and more fit for the Indians themselves to enjoy living there, which I trust that no political considerations will be allowed to cloud.

## FROM UNIVERSITY TO INDUSTRY.

### A Clearing House Proposal.

Sir Richard Vassar-Smith presided on Tuesday, May 20, at a meeting of representatives of the universities and colleges and representatives of the Federation of British Industries called to consider the setting up of an organization which might act as a clearing house between universities and the industries of the country.

The meeting was attended by representatives of the Universities of Birmingham, Bristol, Cambridge, Durham, Glasgow, London, Manchester, Oxford, Sheffield, and Wales, the Imperial College of Technology, and the University College of Nottingham. Letters had been received from Queen's University, Ireland, and Liverpool University, expressing their sympathy with the scheme.

The Chairman said that it was desired to make some arrangements by which young men leaving the universities would have the opportunity of passing into productive work, which would give full scope to their abilities and education. Such an organization should enable the man of real merit to obtain a post which would allow him to use his abilities to the fullest extent. Personally he felt that such an organization was needed, as in the future it would be more imperative than ever that each man, in whatever grade, should be working efficiently. There was a need in industry for a supply (and the maintenance of that supply), of the best intelligences of the country. It was in order to discuss this question that the meeting had been called.

Mr. H. A. Roberts, of Cambridge University, said that the suggestion would meet with the approval of all interested in national well-being. There were difficulties in setting up such an organization, and it might be advisable in the first case to limit its activities until further experience had been gained; it was very undesirable to begin a scheme on too grand a scale until experieuce had been obtained.

TRAINED MEN GOING OVERSEA.

Professor Ferrier, of Bristol University, pointed out that there had been no difficulties in placing the really first-class men, but men of the second class certainly needed assistance. In many cases the second-class men had made good, when they had been able to obtain a position which offered scope; ability was not confined to academic distinction, and this was especially the case in regard to work in industry and commerce. As a rough estimate he would say that 5 per cent of the first-class university men would be required for research purposes. The remaining 95 per cent would be employed as ordinary routine business men. They had been a marked tendency for the university trained men to proceed oversea, and even in the United States the English university man was generally sure of finding employment. It was to be hoped that this exodus of the finer grade of worker would be stopped by the offer of suitable employment in this country.

Professor Baker, of the Imperial College of Science and Art, stated that the real difficulty was in fixing the second-grade students, although there must really be a demand for them. In the chemical industry, for instance, there was routine work which would be more ably carried out by the trained man. In most cases, at present, this was carried out by the ordinary worker. The value of the well-trained man in routine work was not appreciated at present, and he hoped that the scheme which had been outlined would lead the employer eventually to come to the organization for such men besides the supermen of research.

Professor Lea, of Birmingham University, hoped that the scheme would include all grades of men. Industry needed all grades, and education could never hope to produce men of one grade only. He thought the Federation, being such a thoroughly representative body, could best tackle this scheme, which he felt would encourage closer co-operation between the university and industry.

The Master of Pembroke College, Cambridge, stated that there had been a great increase in the number of employees who were now sending their sons for university training. This was an excellent sign, and should help eventually in obtaining the co-operation for which Professor Lea hoped.

Professor Bulleid, of Nottingham University College, hoped that the institution of such an organization would not mean putting another barrier between the student and the possible employer; he had always found that the most satisfactory method for obtaining posts for the student to write to the employer direct.

Dr. R. A. Duff, of Glasgow University, suggested that it might be found that centralizing vacancies in the proposed clearing house would be the best way of tackling the problem. This was a question of administration, and would no doubt be considered before fully settling the scheme.

Miss M. H. Mead, of Manchester University, asked whether the organization would deal with women. In reply, it was stated that the term "students" had been expressly used in the memorandum to convey that both men and women were included in the scheme.

It was decided that a further meeting should be held shortly to settle practical points in the setting up of the scheme.

# ECONOMIC NOTES.

## AGRICULTURE.

### Diarrhœa in Cattle.

The Bombay Department of Agriculture, has issued the following leaflet (No. 5 of 1919) on Diarrhœa in Cattle,—

It is frequently observed that, on the arrival of the monsoon, cattle are attacked with diarrhœa and that weak animals succumb to its effects in considerable numbers. This is due mainly to the sudden change of diet when animals partake largely of green food to which they are not accustomed. The ill effects may be accentuated by the sudden change of climate resulting in chill.

*Symptoms.*—The frequent passage of very fluid and bad smelling dung. The animal has a staring coat and is uneasy. There may be straining. If inflammation is present there will be loss of appetite, fever and moaning. The animal becomes exhausted. Mucus and blood may be passed. Death results from pain and collapse.

*Treatment.* (*a*) *Preventive.*—Any change of diet should be brought about gradually. Animals must not be allowed to gorge themselves on green food. A certain proportion of dry food of a digestible nature should be given and gradually decreased until animals are accustomed to a diet of purely green food. Animals should not be exposed to sudden cold or allowed to drink excessive quantities of water.

(*b*) *Curative.*—The patient must be kept warm and at the same time given plenty of fresh air. When the weather is cold it should be clothed therefore and kept out of draughts. Small quantities of easily digested food should be given at frequent intervals. Rice gruel should be given in quantities of one to two seers, three or four times a day. Water should be given sparingly. In the first stage it is advisable to give a mild purgative consisting of one seer of linseed or other vegetable oil with half a chattack of turpentine added. After that the following medicine should be given in gruel twice a day :—

| | | | |
|---|---|---|---|
| Powdered chalk (karya mitti) | ... | ½ | chattack. |
| or | | | |
| Charcoal (kolsa) | ... | 2 | do. |
| Powdered catechu (katha) | ... | ½ | do. |
| Powdered ginger (sonth) | ... | ¼ | do. |
| Powdered opium (aphem) | | | |
| or | | | |
| Indian hemp leaves (bhang) | ... | 1 | tola. |
| Country liquor (sharab) | ... | 2 | chattack. |

For calves give a quarter of the above quantities.

# CO-OPERATION.

### Long Term Loans in Malnad.

The following note on the organization of a financing agency for long term loans on the mortgage of immovable property in the Malnad has been issued by the Mysore Economic Conference for discussion:—

The proposal is to establish an institution with limited liability for the purpose of making long term loans on the mortgage of immovable property. The institution will be cast on co-operative rather than on joint-stock lines in order that the opposition of interests between the lender and the borrower which is always likely in an institution of the latter kind may not be possible in this case. The membership of the institution will be open to the whole State, but the loans will be confined to the agriculturists in the Kadur, Shimoga and Hassan Districts. The share capital is fixed at 5 lakhs made up of 10,000 shares of Rs. 50 each.

The management of the institution will be similar to that of ordinary credit society. Subject to the control of Government through the Registrar of Co-operative Societies, the general body will be the controlling authority in all matters relating to the Bank. For the daily working of the Bank, the general body will elect a small Board of Directors who will administer and conduct the affairs of the Association, prepare and issue agreements, declarations, etc., and generally represent the Bank. The Board will also be empowered to appoint, control, and dismiss paid officials like cashiers, agents, book-keepers, etc. The work of the Board of Directors will be controlled by a Board of supervision who will pass accounts, issue instructions to the Board of Directors from time to time with regard to the general working of the Bank, authorise the issue of mortagage Bonds and decide appeals against the Board of Directors.

The object of the Bank is as already stated, to make loans to the malnad ryots for the purpose of redeeming them from their prior indebtedness on the mortgage of immovable property. An investigation was made some time ago into the indebtedness of the agriculturists of two hoblis in the Sagar Taluk. The number of families examined was 2,100, of whom 1,650 were found to be indebted to the extent of just over 5 lakhs. Nearly half the number of families above own no lands and do not therefore come under this scheme. Of the remainder, nearly

half, or about 400 to 450 families are fairly heavily indebted. But if they are relieved of their indebtedness and enabled to carry on their occupation, they can, it is believed, work themselves up into an independent position in the course of about 25 years. The loans of the proposed Bank are intended to be confined only to such cases; and in order that the Bank may benefit as large a number of agriculturists as possible, the loans are limited to a minimum of Rs. 1,000 and a maximum of Rs. 5,000, and in no case will a loan exceed 60 per cent of the value of the properties on which it is secured.

On the above basis, the capital required for the Bank has been calculated at about 30 to 50 lakhs. For the present, it is intended to limit it to 30 lakhs. Of this 5 lakhs will be raised from shares and the rest from advances from Government and the issue of debenture bonds. After the formation of the Bank it is intended to approach the Government for a substantial advance of about 5 to 10 lakhs. It is also intended to issue redeemable debenture bonds. These bonds will be issued on the security of the immovable property of the borrowing members. They will carry interest not exceeding 6 per cent and will be redeemable in 25 years. For this purpose, a sinking fund will be formed. The Bank will also have the power of recalling the bonds at any time if its funds permit of such recall. It is proposed that the interest should be guaranteed by the Government.

Some more details will be found in the draft bye-laws which will be circulated to the members. Reference may however be made to one or two points on which the bye-laws are silent. One of these points is the method of valuing the properties on which loans are to be granted and debentures to be issued. This valuation has to be very accurately made and the Bank will therefore have to have competent agents for the work. In the duties of these agents will be included not merely the valuation of properties but also the supervision of the use to which loans are put by members taking them and periodical inspection of the properties on which these loans are secured.

A second point is that it is proposed to give to this Bank the power of foreclosing a mortgage without recourse to a Civil Court. Such power is given elsewhere and it is believed that there are no serious objections to invest the Bank with this power.

A third point is that it is perhaps advisable to entrust this work to the Central or the Provincial Bank as both already possess an organization complete in most details. It is understood that both the institutions are prepared to take up the work.

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## APPENDIX.

### THE MALNAD LAND MORTGAGE ASSOCIATION.

1. This Association shall be called the Malnad Land Mortgage Association.

2. The offices of the Association shall be situated at Bangalore.

3. The object of the Association is to grant loans to members provided that such members reside or own immovable property in the malnad portions of the districts of Kadur, Shimoga and Hassan.

4. The liability of the members of this Association shall be limited to the value of the shares held by them in the Association.

5. There shall be 10,000 shares in the Association of the value of Rs. 50 each.

6. Membership of the Association is open to every subject of His Highness the Maharaja of Mysore who is legally capable of entering into a contract.

7. Every member of the Association must take at least one share and no member can own more than 100 shares in the Association.

8. Shares are not withdrawable nor transferable except with the sanction of the Association.

9. The Association may raise funds by loans, by debentures and by grants by the Government of His Highness the Maharaja of Mysore, but at no time shall the liability of the Association exceed the sum of Rs. 30,000,000.

10. The Association shall not grant loans below Rs. 1,000 nor above Rs. 5,000 in any case, provided that where a loan is granted to a Co-operative Society for the use of its members, the amount of the loan shall not exceed Rs. 20,000.

11. Loans granted by the Association shall bear interest not exceeding 7 per cent per annum.

12. Loans granted by the Association shall be repayable in equal yearly instalments not exceeding 25. Nothing in this bye-law shall be considered to preclude the borrower from repaying his loan wholly or in part in cash or in mortgage.

13. The yearly instalment referred to in Section 12 shall be calculated as follows:—

The interest due on the loan for the period which it is granted shall be added to the principal and the total amount shall be repayable in equal annual instalments within the period of the loan.

14. The working expenses of the Association may be recovered by the levy of a charge not exceeding one per cent per annum on the loans granted by the Association.

15. Loans shall be granted by the Association only on the mortgage of immovable property.

16. Loans granted by the Association shall not exceed 60 per cent of the value of the property which is mortgaged to the Association on account of those loans.

17. The valuation of the properties offered as security for loans shall be made by the Association in accordance with subsidiary rules to be framed in that behalf.

18. Loans granted by the Association shall not be liable to be recalled so long as the annual instalments and other charges due thereon are duly paid, privided that if a loan is utilised for a purpose different from that for which it was granted and if the property on which it is secured is in the opinion of the Association allowed to diminish in value, the loan shall be recalled without reference to the terms on which it is granted.

19. The Association may issue mortgage bonds made out to the holder, bearing interest not exceeding 6 per cent per annum, and liable to be drawn for redemption within a period not exceeding 25 years.

20. Loans are also liable to be recalled—

(1) If after the grant of a loan the information obtained regarding the property, the charges thereon and the rights of disposal thereof is found to be incorrect;

(2) On the retirement of the borrower from the Association;

(3) If the debtor remains more than 6 months in arrear with a payment due.

21. If, in any case, not expressly provided for above the Committee of Management consider that a debt is in danger, they shall recall the loan with the approval of the Registrar of Co-operative Societies.

22. When a loan recalled by the Committee of Management is not repaid within 3 months from the date of recall, the Directors shall in the exercise of the authority vested in them under———, order a foreclosure of the mortgage and this order shall have the same effect and shall be executed in the same manner as if passed by a competent Civil Court.

23. The amount of the bonds issued shall not exceed 75 per cent of the claims pertaining to the Association on mortgages.

24. The Association shall draw for redemption by lot as many mortgage bonds as its financial condition permits, or, if the Association deems it preferable, it may repurchase its bonds instead of drawing them by lot.

25. The whole of the assets of the Association, especially its claims on mortgages, are liable for the payment of interest and the repayment of bonds.

26. The interest payable on mortgage bonds and the dividends on shares are guaranteed by the Government of His Highness tha Maharaja of Mysore.

27. The Association shall be at liberty to effect a reduction in the rate of interest payable on any series of mortgage bonds provided that option is given to the holders of such bonds to accept payment in cash at par value.

28. The Administration of the Association shall be vested in the following:—

(1) Committee of Management.

(2) Board of Supervision, and

(3) The General Meeting of the members of the Association.

29. Members of the Committee of Management and of the Board of Supervision must be members of the Association, provided that the Government of His Highness the Maharaja of Mysore shall have the right to nominate a person, whether a member of the Association or not, to each body.

30. The Committee of Management shall consist of seven members, six of whom are elected by the members and one is nominated by the Government of Mysore. Where a member is not nominated by the Government, the seventh member shall be elected by the general meeting.

31. The Board of Supervision shall consist of seven members, six of whom are elected by the general meeting and one is nominated by the Government of Mysore. Where a member is not nominated by the Government, the seventh shall also be elected by the general meeting.

32. Confidential agents may be appointed so far as desirable and as far as practicable, who shall superintend the business assigned to them within fixed areas by the Committee of Management.

33. The Committee of Management may grant reasonable remuneration to the agents for their trouble.

34. The Committee of Management shall administer and conduct the affairs of the Association, prepare and issue agreements, declarations, etc., represent the Association by one of its members selected for that purpose at all legal proceedings. It shall also appoint, control and dismiss officials like book-keepers, cashiers, clerks, local agents, etc.

35. The Board of Supervision shall control and supervise the conduct of business by the Committee of Management. In particular it will—

(1) cause the accounts of the Association to be audited at least once a year by two of its members, to receive and pass the accounts of the Committee of Management;

(2) to present to the general meeting a statement of accounts;

(3) to prepare all instructions necessary for the carrying out of these bye-laws;

(4) to settle the principles of land valuation;

(5) to authorise the issue by the Committee of Management of mortgage bonds; and

(6) to decide appeals against the decision of the Committee of Management.

36. The business transactions of the Association shall be supervised by the Registrar of Co-operative Societies.

37. The Registrar has the right—

(1) to require the summoning of a general meeting;

(2) to be present at the proceedings of the general meeting as well as at the meetings of the Committee of Management, and the Board of Supervision; and

(3) to inspect the books and the cash balance of the Bank at any time.

38. The accounts of the Association shall be audited at least once a year by a duly certified auditor or by an officer deputed by the Mysore Government.

39. All other matters concerning the organization and the working of the association, as well as the remuneration, if any, which the Committee of Management, the Board of Supervision, the confidential agents and the auditors are to receive shall be fixed by Regulations to be framed by the Association.

The Regulation shall require the approval of the Government of Mysore.

40. A reserve fund shall be formed by the Association to serve as a cover for any deficit in the balance sheet. To this shall be carried—

(1) a sum not less than 10 per cent of the net profits of every year;

(2) the interest on the capital of this fund;

(3) amounts not claimed;

(4) produce of drawn and expired mortgage bonds.

41. A special amortisation fund shall be formed for mortgage bonds.

42. Except so far as is expressly provided for in these bye-laws, the Association shall be bound by the provisions of the Law on Co-operative Societies in Mysore.

## INDUSTRIES AND COMMERCE.

### The Ideal Factory.

Mr. B. Seebohm Rowntree has outlined—this he did in a speech at Leeds—what he has described as "his ideal factory." This ideal factory would be built outside the town amid gardens and playing-fields. As to its interior, he would get rid of any institutional or "workhouse" appearance; there would be special attention to lighting, ventilation, and the reduction of noice and vibration; there would be the best canteen to be had for money; a works doctor in daily attendance, with an oculist, dentist and nurse, and rest rooms wherever necessary.

The hours he would work would be the ascertained minimum number that would enable him to produce the necessary output.

"As to my relations towards trade unions," said Mr. Rowntree, "from the outset I shall regard them as my friends. I shall encourage all my people to join their trade union, and they shall have half-an-hour each week for the collection of contributions. With regard to the Government of my business, I shall try to gather round me the very best men I can lay hands on, but I will only get men who have the same ideals about industry. I am going to keep the financial and commercial side of this business in my own hands, but so far as industrial administration is concerned I am going to ask my workers to co-operate to the fullest possible extent.

"For my managers and foremen I am only going to have gentlefolk, gentlemen and gentlewomen from whatever walk of life they are drawn. I am going to tell them they are tobe leaders of men, and to remind them that they can only lead from the front; they drive from behind. I shall encourage overlookers and foremen to form an association amongst themselves. With regard to the workers, I will start straight away to place responsibility upon them by building up a system of councils. As to payment there should be a basic wage and a secondary wage. That basic wage should enable a man to live, marry, and bring up a normal family in a decent home, while leaving a margin for contingencies and recreation. Beyond this there would be an output bonus."

## A LONDON EPHIBITION IN 1921.

The desirability of holding in London in ıe summer of 1921, a great exhibition of the ıanufactures and products of the Empire, in rder to promote the extension of Imperial :ade, was discussed at a luncheon at the British Empire Club on May 20. The proosal received the support of representatives f the Dominions, and it was decided to aproach the Government in order to get the pproval and afterwards to form a large and epresentative committee to organize the rork. Lord Sydenham, Chairman of the British Empire League, presided.

The Chairman recalled that in 1903 the British mpire League passed a resolution declaring that was desirable that an imperial industrial exhibion should be held; if such an exhibition was desirale then it was essential now. It was certain that ıch small undertakings as the Leipzig and Lyons airs had helped to create new business on a large :ale, and, though the first of those fairs had shrunk ıto nothing during the war the second had made a ıost remarkable advance. We had won the war beause we had been a United Empire, and it was, necesary that we should have the same unity for the reconruction which lay ahead. Within the Empire ıere were vast resources still undeveloped, and it 'as to them that we must look to restore the badly ıaken fabric of our industrial life. The prosperity f the Empire and the welfare of its citizione depend-l on our oversea trade, and if we conld not retain ad increase that we should be faced before long ith very grave economic difficulties. We had to ıeet competition, especially that of the United tates and Japan, but he was confident that with a nited Empire we should be able to do so. He ıoved a resolution stating that it was desirable to old a British Empire Exhibition in London in 1921, s an expression of Imperial unity, and as a means ) the promotion of commerce and industry throughut the Empire.

Lord Blyth, seconding the resolution, said he had cted as the organizing chairman of the Franco-British Exhibition and also of the Japanese Exhibion. Lord Hardinge had told him during the war ıat the friendly feeling between France and Japan ad this country had been in no small degree due to ıose exhibitions, and Mr. Balfour, in a letter to im on the subject, had said that the successful co-peration of French and British in the war was due very largely to the beneficial effect of the Franco-British Exhibition. If those exhibition had done so much to bring nations together, he thought an exhibition on similar lines would do much more to bring the Empire together.

Mr. Hughes said that the depth of the ignorance of the different parts of the Empire about each other was rather appalling and the desirability of holding an exhibition of the kind proposed was obvious, for the latent resources of the Empire were unlimited. He did not wish to refer to politics, but he felt bound to point out that trade flowed along certain well-defined channels, and was easily diverted. One of the surest means of binding the Empire together was to ensure that trade should be induced to run along certain channels. What precisely the policy of the Government of this country was with regard to Imperial trade he did not know, not could any Englishman present tell him. A people scattered over the whole earth, which was the trustee of some of its most fertile portions, had the means to make itself great and strong. But if that people was inclined to drop the substance for the shadow to pursue fleeting phantoms, and to try to run with the hare and hunt with the hounds it was attempting the impossible. The electors of Great Britain had to make up their minds what they really wanted. If they wanted Empire there was a clear way to get it; if they did not want Empire there was a clear way to lose it. He was strongly of opinion that an exhibition such as that proposed would be one way of convincing the doubting Thomas all over the Empire—the people who lived in a world of their own, and when they spoke of Empire meant Canada, Australia, or England rather than the great whole that was a within their grasp if they had the courage to put out their hands.

Sir Joseph Ward believed that the fight for supremacy after the war was going to be as great as the fight for supremacy on the battle-fields, and it was to the Mother country that the Oversea Dominions looked to give them a lead. They were on the eve of chaos in the commercial world. The fact had to be faced that, though we were friendly with the United States and Japan, they had been gaining new trade since the beginning of the war. They had secured the trade which Germany had before the war, and much of that which this country had. It was only by co-operation and freedom from Government control that successful competition could be organized. He believed that the exhibition proposed would be a great stimulus to the development of Imperial trade.

Sir G. Perley said it was important that Imperial trade should be developed, for the war had shown

the importance of keeping our resources in our own hands.

Sir E. Bowring said that Newfoundland was prepared to do everything possible to make the exhibition a success.

Sir R. Hadfield thought it might be difficult to hold an exhibition without the help of other countries, though he agreed that, if it could be confined to the Empire, it would be more satisfactory.

Lord Southwark said that, as president of the London Chamber of Commerce at the outbreak of war, he had learned how important it was that there should be full knowledge of the trade of the Empire. There was knowledge that we should have possessed which we had not possessed. We had at that time a machine in this country capable of most important and necessary work, but the only man who could work it was a German, and he had gone.

The resolution was agreed to.

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## COTTON INDUSTRY RESEARCH.

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### Wide Development Scheme.

The British Cotton Industry Research Association was formally constituted at a meeting in Manchester on May 23 after-noon of the signatories of the memorandum of association. The framing of the constitution has occupied many months, and the early hope that the Cotton Research Association would be the first to get to work under the Government's scheme was disappointed long ago.

Exceptional difficulties have hindered the labours of the provisional committee. Conflicting policies have had earnest advocates, and if the committee has moved deliberately there has been the gain of fuller agreement to set against the loss of time.

The objects of the Association are far-reaching. Every branch of the industry from the cultivation of the raw material to the production of the manufactured articles, is within their scope, and the Association will not only concern itself with materials and methods and machinery, but it will also endeavour to enhance the efficiency and the happiness of the workpeople.

The great sweep of its prospective activity is indicated by the following statement of its aims:

"To promote research and other scientific work in connection with the production of cotton and its utilization in industry and generally, in connexion with any branch of trade or commerce, producing, using, and handling cotton, whether in a raw or manufactured state, or producing machinery, accessories, substances, or appliances, to be employed in the production of cotton or its utilization in industry, and to provide and spend money as may be thought necessary or convenient for these purposes and to encourage and improve the education of persons who are engaged, or who are likely to be engaged, in the industry."

In pursuit of these purposes it will employ scientific or skilled persons and maintain scholarships and bursaries for the instruction and support of scholars in research work, or of persons engaged in studying the principles involved in any of the industries using cotton. As soon as possible a Cotton Research Institute will be erected in the neighbourhood of Manchester and here the Association will have its own chemical, physical, textile, and other laboratories. But that is a development not immediately practicable, and in the meantime it will be necessary to make use of existing institutions, such as the Manchester University and the College of Technology.

It will be possible almost at once to found a good textile library and a bureau of information to which "any member of the Association can bring any inquiry relating to his branch of the industry with the assurance that if the information is any where available he will be able to obtain it there."

#### A COTTON MUSEUM.

It is also proposed to establish a Cotton Industries Museum. Ultimately the Association may have not only its institute and laboratories, but also its own workshops and experimental factories, but pending the day of those greater things it will make arrangements for its experiments on a manufacturing scale to be carried on in the works and mill of its members. It is also proposed to establish stations in the cotton fields of the Empire for the investigation of the growth of cotton and the careful and complete study of the scientific problems which arise.

Power is taken to co-operate with other associations and institutions in the prosecution of either scientific or industrial research work, and to encourage the discovery of and investigate and make known the merits and nature of inventions, improvements, methods, operations, processes, designs and materials, and to acquire any patents or licences relating to any such inventions; or to acquire and register any standardization marks on designs, and to use the results of research to benefit the Association and its individual members, both by the prior distribution of knowledge and by the preferential user of any patents or processes.

THE BENEFITS FROM RESEARCH.

It will be possible for special research or other scientific work to be done for particular members or groups of members of the Association upon payment of the full cost of the work, and the use of the results of this research can be restricted to those who initiate it. This important provision will govern all the activities of the Association, whether private or general. "That no invention, improvement, method, operation, process, design, material, patent, licence or trade mark, which may become the property of the Association shall be sold, disposed of, or turned to account, unless reasonable precautions have been taken to prevent the benefit of the same accruing to foreign competitors."

It may be mentioned in this connection that the Articles of Association contain provisions to ensure the limitation of membership of the Association to British subjects or to corporations and firms which satisfy the description of British, by being as to the constitution of the governing body, or the number of the partners, and as to the amount of capital, at least three-fourths British.

It is also stipulated that the business must be mainly, controlled in and from some place in the Empire. No person other than a British subject, resident in the United Kingdom will be qualified to a member of the Council of the Association.

THE FINANCIAL BASIS.

The financial estimates are necessarily, at this stage, rather vague. It is calculated that for the first five years the expenditure will not exceed £ 20,000 a year. A liberal contribution from the Government is expected. The Advisory Council of Scientific and Industrial Research have promised that if the Association raises £5,000 a year for five years, it will recommend the Committee of the Privy Council to contribute a similar amount for the same period, and that if the Association raises more, the Government contributions well also be increased, though not at the same rate.

Each firm or association must pay an entrance fee of £ 5, which will cover what is called the initial period of the formation of the Association.. Subsequently there will be an annual levy based upon the capital employed in the various concerns as follows:- Up to £20,000 capital. £1 levy; up to £4,000 capital. £ 2: up to £60,000. £3: up to £ 100,000. £5: up to £ 200,000: up to £ 500,000 £25: up to £ 100,000, £ 50; and where the capital exceeds a million, the unit of assessment will be £50 for each million or part thereof.

Reckoning on the assumption that half the smaller firms and two-thirds of the larger ones and all the large combines will join the Association it is estimated that the produce of the first levy will be £8,000. The addition of a Government grant of £ 5,000 will bring the year's income to £13,000. The anticipation is that in none of the first five years will the levy exceed two or at the most three times the amount of the first levy.

The Federation of Master Cotton Spinners Association is joining the Research Association in its corporate capacity, and all the members of that Federation will be individual members of the Research Association upon payment by the Federation of a levy at the rate of one-tenth of one farthing per spindle, calculated on the total of the spindles, included in the Federation, looms and other varieties of machinery being assessed in proportion.

THE MEMBERS OF THE FIRST COUNCIL.

The first Council will consist of 25 members of whom 13 will be appointed by the signatories, 5 will be nominated by the Federation of Master Cotton Spinners' Associations, three by the Cotton Spinners' and Manufacturers' Association, 2 by the Employers' Federation of Dyers and Finishers and 2 by the Federation of Calico Printers. The Committee of the Privy Council may appoint 5 other members, whether members of the Association or not, to be additional members of the first council. Subsequent Councils will consist of not less than 20 and not more than 50 members.

One of the first important duties of the Council will be to appoint a director, who will be responsible for the whole internal management of the Research Institute and the direction of all research. With the permission of the Council he may also advise and assist individual members in regard to technical difficulties or suggestions for improvements, and in such matters the director shall be entitled to receive communications given to him in strict confidence without reporting them to the Council.

## BRITISH INDUSTRIES.

### An Imperial Fair.

The Board of Trade has issued the following prospectus :—

This the first year of peace releases the British Industries Fair from the restrictions which the manufacture of munitions of war has imposed upon it. The British Industries Fair of 1920 and the Fairs of the future will be on a scale commensurate with the magnitude of British industry. The knowledge that the country's first duty was to produce munitions led the Board of Trade to prohibit firms

who were mainly engaged in the production of war requirements from exhibiting at Trade Fairs and practically confined the Fairs to a few non-essential trades. The extent to which this policy was carried out is shown by the fact that even such articles as cutlery, electroplate, clocks and jewellery have been excluded from the last four Fairs. But to-day the position is changed, and the contemplated development is able to take place, with the result that it has been found necessary to provide as a home for the Fair in London the Crystal Palace, the largest exhibition building in the world. And already there is grave doubt that this building—gigantic as it is, will prove too small unless special additions are made to it.

The three Fairs, though held in different towns (London, Birmingham and Glasgow), are in reality one Fair. The London Fair is directly organised by the Board of Trade, while the Fairs in Birmingham and Glasgow are organised by the Municipalities of the respective cities under the auspices and with the support of the Board. An important point in the organisation of the three Fairs is that they are held concurrently, each Fair representing a specified group of industries and no one industry being permitted to exhibit at two Fairs.

Under the new scheme which thus comes into being many trades which in the past have been unrepresented by a Trade Fair have an opportunity of exhibiting their productions, and foreign buyers will have an opportunity of seeing at one time an enormous range of the country's productions. The success which has attended the five Fairs already held in London has satisfied the Board of Trade as to the correctness of the system on which they have been organised and the coming Fair, though so vastly increased in scope, will be run on the same lines.

The British Industries Fairs are not Exhibitions. They are Trade Fairs to which admittance is restricted to *bona fide* trade buyers seriously interested in the participating trades, and admission is by invitation only. Participation in the Fair is confined to British manufacturing firms which shall be deemed in this instance to be firms which shall be deemed in this instance to be firms and head offices are situated within the British Empire and which are not controlled by foreign interests. Exhibitors are not permitted to exhibit goods other than those they actually manufacture. The result is that buyers who visit the Fair know that no article shown on an exhibitor's stand can be purchased elsewhere, in the Fair, while the exhibitors on their side can rely on the fact that all visitors are trade buyers. So organised, the British Industries Fair is immeasurably more valuable to both exhibitors and buyers than a Fair in which the same article may be shown upon many exhibitors' stands and where the visitor may spend much of his time in comparing the different prices at which it can be purchased. By excluding the general public and restricting admission to trade buyers the exhibiting manufacturer is saved the great waste of time in which he would be involved by exhibiting and explaining his wares to persons who had no other motive for visiting the Fair than that of curiosity. In these two particulars the organisation of the British Industries Fairs shows a great advance upon other Fairs.

Another point in which the British Industries Fairs are an advance on the Fairs which have been organised in various towns on the Continent is that participation in the Fairs is restricted to manufacturers of goods which are really suitable for inclusion. At some of the Fairs which have been held on the Continent such articles as railway engines, big guns and other products of engineering works have been exhibited, although it is clear that they are not articles which are purchased by the trade buyer in quantity for stock and resale. An examination of the schedule of the trades included in the British Industries Fair, 1920, will at once show that participation is confined to goods which are such as would be purchased for re-sale by wholesale and retail tenders.

For manufacturers, participation is both cheap and simple, since, although the Fairs are financially self-supporting, the making of a profit is not aimed at by the Board of Trade, and because, so far as possible, each exhibitor is allowed to exhibit in the form he prefers. At no other Fair can an exhibitor place his samples before the world's buyers for so trivial a sum as at the British Industries Fair. Many exhibitors on small stands measuring 6 feet by 6 feet have been able to display their samples for a total sum of less than £10, and many exhibitors have found that their total expenses did not amount to 1 per cent, on the orders which they booked. In one case which has come to the Department's knowledge an exhibitor's total expenditure was less than ½ per cent.

Applications for space from eligible manufacturing firms in India must be made before the 1st September, and can only be received through—H. M. Trade Commissioner, McLeod House, 28, Dalhousie Square, Calcutta.

## POSSIBILITIES OF THE INDIAN CHEMICAL INDUSTRIES.

A paper by Mr. H. N. Morris (Technical Chemist) on "The Industrial Development of India, with special reference to the Chemical Industries," was read at a meeting of the Manchester Section of the Society of Chemical Industry held on 4th April, 1919.

Mr. Morris stated that the industrial development of India in the past had been retarded by the absence of plentiful supplies of coal, but with the utilisation of other sources of power—oil fuel from Persia and hydro-electric power—and the increase in the production of coal, the position had undergone a great change. Oil fuel had been used for steam raising purposes in Bombay with success, the efficiency being about twice that of coal. Several water-power undertakings were now in operation, the most important being the Tata Hydro-electric Power Supply Company, which was supplying current at the rate of 0·55 anna per unit, including the provision of electrical installation, and day and night loads at a lower rate. The last report of the Tata undertaking stated that forty-one mills in and around Bombay were being supplied. The present B. H. P. of motors in service was 45,000, in addition to 5,500 H. P. supplied to other consumers. Further extensions by the company were in progress. Another undertaking, the Koyna River scheme, was estimated to give as much as 300,000 H. P. for 8,000 hours in the year.

Dealing with the present position and prospects of the heavy chemical industries of India, Mr. Morris said that salt, a basic raw material, was produced in large quantities, about three-fourths of the annual consumption of between 1,750,000 and 2,000,000 tons being of domestic production. Two-thirds of the total output was derived from the solar evaporation of sea-water, and the remainder partly from rock salt in the Punjab and partly from salt lakes in Rajputana. Unfortunately, Bengal, where other conditions were favourable to the manufacture of heavy chemicals, was compelled to import salt, but, in the author's opinion, the manufacture of this material, accompanied by the recovery of bromine and magnesium and potassium chlorides, was a practicable proposition. Notwithstanding the large and cheap supplies of salt manufactured in various parts of the country, no important alkali works were in existence. Several plants were producing caustic soda—those of the Eastern Chemical Company, Bombay, and the Magadi Soda Company, Calcutta,—but they were only for the treatment of imported soda ash. No attempt had yet been made to manufacture either caustic soda or carbonate of soda from native salt. Another important product, sulphuric acid, was being produced satisfactorily by the Eastern Chemical Company: Waldie and Co., Calcutta; Parry and Co., Madras; and the Burma Chemical Industries, Rangoon. In addition, the Bengal Steel and Iron Company, Kulti, and the Tata Iron and Steel Company, Sakchi, manufactured sulphuric acid for the conversion of ammonia from their by-product plants into sulphate of ammonia. Up to now the manufacture of sulphuric acid on a large scale had been retarded by the absence of sources of cheap sulphur, manufacturers having to rely upon the importation of Italian and Japanese sulphur. In this respect the author hoped that the situation would be relieved by the utilisation of Burmese zinc concentrates, the development of known sulphur deposits within easy reach of the West Coast of India, and the treatment of native copper sulphide ores. The Eastern Chemical Company and other firms who had supplies of sulphuric acid available were making hydrochloric and nitric acids in sufficient quantities to meet the immediate demands of the country.

The writer next referred to the iron and steal industries of India, which had shown remarkable development during recent years, the most important concerns being the Bengal Steel and Iron Company and the Tata Iron and Steel Company. The yearly production of coke-oven by-products by the Tata Company, when the whole of the plant now under construction was completed, was expected to be 2,300,000 gals. of crude naphtha, 10,000 tons of sulphate of ammonia, and 40,000 tons of tar. The large amounts of benzole, toluol, naphtha, and creosote available from the recovery plants at these works opened up possibilities for developments in chemical manufacturing, and the companies were quite alive to the fact. Arrangements were being made for the establishment of a cycle of industries around the Tata's works at Sakchi, including spelter manufacture, galvanised iron, sulphuric acid from concentrates, benzole purification, and general coal-tar products manufacture, and the utilisation of the slags.

In the development of the basic chemical indutries fertilisers would undoubtedly play an important part. The question was, how far could India supply herself with the required chemicals? Potash in the form of nitrate was an old Indian industry, and in the last ten years the yearly production had varied from just under 15,000 tons to 25,000 tons. That might be increased possibly by concentration of the salt manufacture and the recovery of potash from the mother

liquors, and also from the blast-furnace gases, but nothing had yet been done in those directions. Phosphates presented a difficulty. Some of the crops in India, notably indigo, required superphosphates, and so far no cheap source of manufacture had been found. No good quality of phosphate of lime has been found in India which would be suitable for the manufacture of superphosphates. Most of the phosphate discovered had been in the form of nodules containing a high percentage of carbonate, and thus quite unsuitable for treatment with sulphuric acid. Some large deposits of mixed phosphates of lime and aluminium were said to have been discovered in Bengal, but so far as he had been able to ascertain, those had not been suitable for treatment with acid. There were, however, excellent deposits on the Red Sea coast that could be shipped at a low cost to the West Coast ports, which would place India in as favourable a position as most countries, and better than either Japan or European countries, which had to import their phosphate rock. The difficulty with regard to sulphuric acid, already referred to, could only be remedied by cheap sulphur or sulphur ore. Ammonia was available in the form of sulphate of ammonia from the coke-ovens, and would be available in increasing quantities from that source, but would be only a fraction of what India would require when the advantages of fertilisers were understood. Nitrates, with the exception of the comparatively small quantities of nitrate of potash obtained from earth deposits, would have to be imported until it was possible to produce economically by the fixation of atmospheric nitrogen.

Until the Tata Hydro-electric Power Company had proved that power could be produced economically from the Western Ghats, the establishment of industries requiring chief electricity for their success could not be considered. The conditions were now changed. The production of hydro-electric power at such a low cost as had been proved possible made practicable a number of electro-chemical industries which would not otherwise have been considered. These included the manufacture of aluminium from bauxite, which was plentiful and of good quality; the decomposition of salt and the production of soda compounds; and lastly, but of greater possibilities, the fixation of atmospheric nitrogen, and the production of ammonia and nitrates. All these were now practicable propositions for India. So far as the author was able to judge, Switzeraland, Norway, or even Niagara could none of them compare with such schemes as the Koyna River and other water-power undertakings in India.

Twenty years ago India, in addition to supplying its home requirements, exported natural indigo to the value of 3½ millions sterling per annum, but prior to the war that had gone down to £142,000, owing to the competition of the German synthetic product; in 1916 it had risen to £1,385,000 and 1917 was practically the same. It was now a question as to whether the competition of the synthetic product would drive the natural indigo from the market. In 1917, Mr. Morris visited one of the best conducted of the indigo works in Behar and discussed the position and prospects of natural indigo with Mr. W. A. Davis, the Indigo Research Chemist, and Dr. Hutchinson, of the Pusa Agricultural College. It had been definitely established that by the use of superphosphate as a fertiliser, the yield of indigo per acre could be increased both in quantity and quality. Unfortunately, superphosphate was not yet made on a large scale in India, and there had been difficulties in obtaining supplies during the war. It was essential that the fertiliser should be manufactured in India, and supplies assured for such industries as that of indigo if they were to have any chance of success. Great improvements had been shown to be possible by means of scientific control of the fermenting process, enabling the manufacturer to obtain increased yields of colour from the leaves. It was also considered necessary that natural indigo should be standardised and sold in a paste form and that this standardisation should be done in India for use both in the country itself and in those other markets where a standardised paste was preferred. It had been impossible to carry out all the proposed improvements during the war, but if they were carried out, and if the planters worked together, he thought, with Mr. Davis, that natural indigo would be able to put up an interesting fight with the synthetic dye.

Various proposals had been made for the establishment of wood-distillation works in India, but nothing of value seemed to have been done. There was a certain amount of risk in any such undertaking, as the products, such as wood naphtha, tar, and acetate of lime, would have to be placed on the market, and the demand for them in India had not been of any importance in the past. A market whould have to be created. The charcoal produced would have to pay heavy carriage charges if the local market did not consume all that was manufactured. A distillation plant in connection with a large saw mill, where the waste timber and sawdust were destilled, would certainly have a chance of success if favourably situated for the distribution of the charcoal. In 1916, 286 million cubic feet of timber were produced in India, but that was only a fraction of what might be expected from the 249,000 square miles which the Forest Department controlled. Waste vegetable products, such as the paddy husk, could also be carbonised where produced and give the same

products, if the local demand for them or the prices obtainable for export justified the necessary capital outlay. The conversion of the 50 per cent to 60 per cent of cellulose contained in timber into dextrose and alcohol economically was said to be now accomplished. That opened up new possibilities of development in the manufacture of a cheap methylated spirit for domestic use, but the writer did not think that it was likely to become a serious competitor of kerosene and petrol, as some people suggested.

From what had been said, it was evident that if only a fraction of these extensions or developments of chemical industries were carried out—and for the most part they were sound in principle,—there would be a marked increase in the demand for trained chemists, engineers, and foremen. The question of education, and especially the provision of technical education of an advanced kind, had naturally had the serious consideration of the Indian Industrial Commission. In the past the system of higher education in India, as pointed out by the Commission, had encouraged literary and philosophic studies to the neglect of those of a more practical nature. It was not until the beginning of this century that after an Education Conference at Simla, called by Lord Curzon, drastic reforms were carried out in higher education generally, and in technical and industrial education in particular.

DISCUSSION.

The discussion was opened by Mr. D. T. Chadwick, I.C.S., (Indian Trade Commissioner in London). Mr. Chadwick said that the absence of a real trade policy in the past had, had something to do with the backward state of Indian industries, and the feeling of dissatisfaction created had resulted in the appointment of the Indian Industrial Commission. A great need existed at the present time for the development of the heavy chemical industries in India, as upon these depended so many other branches of industrial activity.

Mr. J. Allen said that India was providad with enormous natural resources, and the sooner that fact was realised the better. Many of the products previously imported into India would in the future be produced in that country, and those who recognised the position the soonest would so modify their businesses as to be in a position to take full advantage of any opportunities that presented themselves. As an example, he stated that much of the oil seed that was now exported from India would be dealt with in that country, and an export trade started in the finished products.

Mr. Rawson, speaking from a long and intimate association with the Indian indigo industry, said that having regard to the quantities of synthetic indigo now being produced in the United Kingdom and America, as well as in Germany, and to the excellence of the product, he could not see how natural indigo was going to compete.

Mr. Khotibasker, referring to Mr. Morris's remarks regarding the supply of phosphate for the manufacture of superphosphates, suggested the use of bones. In his reply later, the author stated that bones had been used for that purpose by the undertaking in India with which he was associated, but the high cost of the bones and of the necessary sulphuric acid rendered the process impracticable so far as India was concerned.

Mr. Fernandez said he had found that the Indian workman could adapt himself very well to the difficult chemical processes in operation at some of the works with which he was connected when in India.

Mr. G. Gunn said that the only way in which the alkali industry in India could be developed along modern lines was by the electrolytic processes for the decomposition of salt. If the alkali industry were so developed, other industries, such as the manufacture of soap, paper, etc., would receive a very considerable impetus.

## CHEMICAL INDUSTRIES.

### Reported Discovery of a New Alkaloid.

The Chemists of the United States Department of Agriculture, in conjunction with the Bureau of Plant Industry, claim to have extracted a new alkaloid from the plant called in Mexico "Gobernadora," the *Covillea tridentata* of botanists, which grows in the semi-arid districts of Mexico, New Mexico, etc. The odorous characteristics and medical properties of this plant have long been known to natives and explorers, but it is only just recently that the presence of a new alkaloid has been recognised says the *Board of Trade Journal*. The possibilities of this alkaloid in chemical and pharmaceutical preparations are now being ascertained.

"Gobernadora" is a shrub which grows in vast quantities in the States of Zacatecas, San Luis Potosi, Coahuila, and Durango, a little north of the Tropic of Cancer, in about the same zone as guayule is cultivated. It grows to a height of from one to one-and-a half metres. It is estimated that a million

tons of ashes, rich in potash, can be produced yearly from the green shrub now growing. It takes about one year for the plant to develop from same roots after cutting. The leaves smell of idoform.

It is stated that in 1912 two German chemists obtained permission to make experiments on one of the haciendas situated in the States of Zacatecas and San Luis Potosi. Permission was granted on the understanding that they would furnish an exact report of their findings. The chemists made extensive experiments and disappeared without furnishing the report. Investigations indicate that after experimenting with several plants and shrubs they burned "Gobernadora" and apparently found satisfactory results in the ashes of this plant, as they departed immediately.

## STATISTICS OF THE ELECTRIC POWER INDUSTRY.

According to a Report issued by the Department of Commerce, the electric light and power stations in the United States during the year 1917 generated more than 25,000,000,000 kilowatt hours of electric energy, producing an income of more than a half billion dollars, and gave employment to more than 100,000 persons, whose salaries and wages aggregated nearly 100,000,000 dols.

The output in 1917 was more than double that for 1912 and more than quadruple the output for 1907. The report covers both commercial and municipal plants, but does not cover electric plants operated by factories, hotels, etc., which generate current for their own consumption, plants operated by the Federal Government and State institutions, nor plants that were idle or in course of construction.

The figures show great strides in the industry during both of the five-year periods, 1907-1912 and 1912-1917. The output of electric energy by the light and power stations increased at a considerably greater rate and their expenses at a slightly greater rate than their income, and the rate of increase in the number of persons employed was much smaller, particularly during the later five-year period, than that in the amount of business done.

### ESTABLISHMENTS.

The total number of establishments increased from 5,221 in 1912 to 6,541 in 1917, the latter comprising 4,224 commercial and 2,317 municipal establishments. The increase indicated by these figures is somewhat misleading, since 2,296 new establishments came into existence between 1912 and 1917, but as a result of combinations in the commercial systems and various other changes, the net increase was only 1,320, comprising 565 commercial and 755 municipal stations.

### INCOME AND WAGES.

The total income of the stations in 1917, of which 95·3 per cent represented electric service, amounted to 526,886,408 dols., an increase of 74·3 per cent as compared with 1912, and of 200 per cent as compared with 1907. The total expenses were 427,136,049 dols., or 82·1 per cent more than in 1912, and 218·3 per cent more than in 1907. The employees of the light and power stations numbered 105,546, an increase of 33 per cent over 1912 and of 121·6 per cent over 1907 and their salaries and wages aggregated 95,239,954 dols., an increase of 55·7 per cent as compared with 1912 and of 168·9 per cent over 1907.

### HORSE-POWER.

The total primary power in 1917 amounted to 12,857,998 horse-power, an increase of 70·8 per cent. as compared with 1912 and of 213·7 over 1907. Of this power nearly two-thirds—8,389,389 horse-power—was derived from steam; almost one-third—4,251,423 horse-power—from water, and the remainder—217,186 horse-power, or less than 2 per cent—from internal-combustion engines. The corresponding proportions for 1912 and 1907 differed but slightly from those just stated. The average horse-power per steam engine shows a very great increase—from 334 in 1907 to 631 in 1912 and to 1,124 in 1917. The average horse-power of the water wheels also shows a marked increase from census to census, but in the case of the internal-combustion engines there has been a decline. The total dynamo capacity, 9,001,872 kilowatts in 1917, represents an increase of 74·3 per cent as compared with 1912, and 232·2 per cent over 1907, these rates of increase being slightly greater than the corresponding ones for total primary power. The output of electrical energy aggregated 25,438,611,417 kilowatt hours, an increase of 119·9 per cent for the period 1912-17 and of 333·0 per cent for the decade. Of the 6,541 establishments reported for 1917 those which purchased all their electric energy from other establishments numbered 1,422, as against 507 in 1912 and 227 in 1907.

The figures indicate that the arc lamp for street lighting is being fast superseded by the incandescent of various types. The former class of lamp decreased in number from 348,643 in 1912 to 256,838 in 1917, the reduction amounting to more than one-fourth; while during the same period the number of incandescent lamps more than doubled, increasing from 681,957 to 1,389,382.

## SERICULTURE.

### Progress in Kashmir.

The following are extracts from the Report on the Administration of the Jammu and Kashmir State for the Sambat year 1972 (1915-16), recently issued :—

(A) KASHMIR.

The year opened under the depressing conditions described in last year's report, but in July a remarkable revival began, owing to various causes, such as the War, the shortage of the European crop, heavy purchases by America, etc., and prices in the next few months rose to unexpected heights, until about the end of the year (April, 1916) records were reached. There has since been a slight reaction, but prices are still higher then they have been at any time since 1893, though not much higher than in 1907, the last year of high prices. The enormous increase in frights and insurance rates, especially the former, was a serious drawback, but a large amount of silk was sold at excellent prices, and the year has been a prosperous one for the Sericulture Department.

The cocoon crop was 33,862 maunds, very little more than in Sambat 1971, though the amount of seed was somewhat larger. This is again rather a poor result, due chiefly to a considerable part of the seed having been delayed in transit owing to the War, and also to unfavourable weather and cholera during the latter part of the rearing season. The attempt to introduce rearing in Skardu, having continued for several years, has proved a failure and has been given up.

Local seed for almost the first time gave poorer result than imported, 31 seers 8 chataks against 36 seers 9 chataks per oz. The amount of seed used was 4,427 oz. (12 per cent), against 3,726 oz. (10 per cent) in Sambat 1971. None of the new filatures was completed during the year, and it is, therefore, very creditable that the cocoons reeled rose from 7,883 to 19,003 maunds: this was due to the mild winter which rendered it possible to keep the filatures at work throughout the year, hitherto supposed to be impracticable with the present filatures, while towards the end of the year nightwork was introduced with complete success in order to meet the increased demand. The total outturn was 1,69,921 lbs. 9 oz. 11 dr. compared with 78,323 lbs. 10 oz. 11 dr. in the preceding year. The average outturn of silk No. 1 decreased from 6 lbs. 13 oz. 9 dr. last year to 6 lbs. 6 oz. 8 dr., while that of inferior silk and waste increased from 3-2-9 to 3-13-7. Considering, however, that more No. 2 cocoons were reeled during the year, and the silk reeled from them was shown as No. 1, the outturn seems satisfactory.

Kashmir appears to have solved quite satisfactorily the difficult problem of electric heating of the basins, and is in this respect in advance of the rest of the world; in the new filatures steam heating has been retained for the cooking basins, for which electricity was found unsuitable, and for the spinning basins, power will be supplied at the cheap rate of Rs. 22-8 per basin per annum. It will be very interesting to see the effect on the quality of the silk produced in the new filatures when they are ready.

The attempt to establish business relations with Siam was fairly successful; more important was the endeavour to obtain a footing on the American market, as to which negotiations were in progress. At the same time, the Indian market was not neglected. In Europe, the record price of twenty-one shillings per lb. was secured; the prevous highest price was a little over seventeen shillings in 1907. The average price for the year, however, was naturally much lower, being 12*s*. 8*d*. per lb. The result of the year's working was a profit of Rs. 9,58,010 which has been exeeded only once before. The net profit to date is Rs. 68,78,080.

(B) JAMMU.

The industry was subject to the same conditions as have been mentioned above in regard to Kashmir, namely, a very inactive market at first, followed by an extraordinary rise in prices and an equally extraordinary rise in freights and insurance, both of which were in some cases ten times as high as in July, 1904.

Silk-rearing has now extended to all tahsils of the Jammu Province, except Akhnur, Samba and Jasmergarh. Progress in this respect is considered to have been rather too rapid, adequate supervision in a difficult country like that of the Jammu Province being far from easy. The quantity of seed distributed rose from 4,014 oz. last year to 4,055 oz., but the outturn of cocoons fell from 29·9 to 28·2 seers. Unfavourable weather and the damage done to the seed in transit from Europe owing to the war were the causes responsible for the decrease in outturn. Jammu is less fortunate than Kashmir in regard to seed distribution, official supervision, climate, and the disposition of the people, but the yield hitherto has been less than it ought to be even under such conditions, and it is to be hoped that future years will show better average results.

In the filatures, labour continued to be a difficulty. The factory worked 300 days (29,010 basins) against 264 days (31,585 basins) in Sambat 1971, the average attendance falling from 255 to 221. The outturn per maund reeled was 5 lbs. 3 oz. of No. 1, and 7 lbs.

13 oz. inferior and waste, against 5 lbs. 1 oz. and 6 lbs. 15 oz. respectively. The total outturn of silk No. 1 rose from 6,694 lbs. 3 oz. last year to 7,814 lbs. 5 oz. and that of inferior silk and waste, from 5,428 lbs. 8 oz. last year to 8,855 lbs. 10 oz. Reports from Europe show that the quality of silk has also improved.

The superior silk was nearly all exported, Indian sales being confined chiefly to cocoons and puda. The year closed with a small balance of No. 1 and a largely increased balance of waste of different kinds, which is less able to bear the increased charges for freight and insurance. Prices realized were satisfactory, ranging from 11·3 francs per kilo. in January to 52·50 francs per kilo. in March. The Preliminary Balance Sheet shows a profit for the year of Rs. 42,107 a very satisfactory result; and a total loss to date of Rs. 52,393, which is really not so much, as the stock on hand is worth more than its book value.

### Mulberry Culture.

Steps are being taken to extend nursery work and to propagate early budding varieties as opportunity offers. In Jammu, the number of trees transplanted fell from 10,000 last year to 5,850 and these suffered from unfavourable weather, but in Kashmir, the number of plants given out showed a very considerable advance (33,398) on the 14,000 trees distributed last year. The total number of trees planted to date in Kashmir amounts to 2,45,215 of which 68·98 per cent is reported to have survived. The net income of the department from sales of wood and fine was Rs. 5,813, as compared with Rs. 5,700 in the preceding year. It is to be regretted that the people still take very little interest in mulberry planting, although the Durbar has done much to encourage it. This is chiefly attributed to the restrictions relating to the mulberry trees which have proved disadvantageous to sericulture as well as harassing to the people. The removal of all restraint is, however, impossible. As the result of further consideration it is now suggested that the concessions already sanctioned regarding payment to Zamindar of the value of dry mulberry wood removed from the land which has remained inoperative so far, should, in future, be allowed to them in practice, and the people in a few villages or small blocks of villages, when they have taken even a slight interest in mulberry plantation, should, as a tentative measure, be released from the mulberry rules as regards trees on their own lands.

## SILK INDUSTRY IN SWITZERLAND.

According to reports received from reliable sources, the silk industry in Switzerland is in a precarious state, says the *Journal of the Board of Trade*. This is particularly the case with regard to the silk textile trade in the district of Zurich and the silk ribbon trade of Basle.

These two trades combined form the principal and most important industry in Switzerland. They employ in normal times about 45,000 hands, with 15,000 looms, and deal with over 2,000,000 kilogrammes of silk imported from France, Italy, and Japan. Almost the whole of the produce of the Swiss silk industry is exported. Approximately 70 per cent of the silk goods manufactured at Zurich were formerly exported to the United Kingdom. There are no statistics available regarding the exact amount of silk stocks held, but they are stated to run up to from £5,000,000 to £6,000,000 at the present moment. Mills have been obliged to reduce their output, and the number of looms actually running is stated to be only about 75 per cent. of the number working in normal times, and it is anticipated that there will soon have to be a further reduction to 50 per cent.

A general accumulation of raw material has resulted from the reduced exports. It is estimated that on 30th June, 1918, there were stocks of silk thread in Switzerland amounting to 250,000 kilogrammes. At the end of last December this figure is stated to have increased to 775,000 kilogrammes. The alleviation in the restrictions which took effect on the 1st March, 1919, permitting silk imports into England to the extent of 50 per cent of the value in francs imported in 1916 does not appear to have given the general satisfaction which was anticipated.

With regard to the Basle silk ribbon industry, the relaxation in the restrictions has come as a great relief to the industry. In 1913 the Basle industry produced 7,000 cwt. of silk ribbon valued at 42,063,000 francs, of which over half (4,098 cwt.), valued at 23,930,000 francs, were exported to the United Kingdom. In 1916 these exports rose to 10,000 cwt. valued at 73,114,000 francs, of which 7,226 cwt., valued at 48,632,000 francs were exported to Great Britain.

Switzerland's share in the imports of silk goods into the United Kingdom has been comparatively small during the latter part of the war. During the first eleven months of 1918 Great Britain imported

from all sources 86,800,000 yards of silk goods, to the value of £12,500,000, as against 65,700,000 yards, to the value of £7,700,000, during the same period of 1917. Switzerland's share in these imports decreased from 6,800,000 yards in 1917 to 3,400,000 yards in 1918. At the same time the Swiss point out that the imports of silks into the United Kingdom from Japan and Italy, and of silk mixtures from France have greatly increased.

The Swiss have been compelled to reduce their output, and some mills have been forced to work short hours or even close down. The Swiss Government has recognised the seriousness of the crisis; in cases where the mills have to be closed down the workmen receive two-thirds of their wages, half of which amount is paid by the mill owner and half by the Federal Government.

## SANITATION AND PUBLIC HEALTH.

### Influenza.

The following Memorandum *Notification No. G. 50 (one)—Med. 56-18-112, dated 8th July,* 1919, on Influenza has been issued by the Government of India for general information :—

During 1918 a peculiar and exceptionally widespread epidemic of Influenza appeared, which affected the inhabitants of practically every continent. This epidemic not only caused directly or indirectly, a very large number of deaths which in India alone were computed to exceed five million, but left behind it a legacy of minor ailments with consequent national debility. The economic effect through the disorganization of trade cannot be estimated but must have been very great.

Although previously severe and world wide epidemics have been known to occur, in none were the spread and mortality so alarming as in the epidemic of 1918. So far as it affected India, the epidemic of the summer months assumed a mild form of the disease. After an apparent departure, it re-appeared in a virulent and very fatal form during the autumn months and then seemingly disappeared at the end of the year. In fact this was not so, as small localized epidemics have occurred and sporadic cases have continued throughout the present year. As the experience of epidemics in England and elsewhere has been that recrudescences at intervals are liable to occur, it is highly desirable to be prepared for such an event in India.

With this object in view, this Memorandum has been prepared, which sets forth opinions founded upon the valuable observations made during the 1918 pandemic and contained in the world's medical literature and which furnishes in the abstract a list of the preventive measures that promise to give the best results in India. It is not possible to say that even with the adoption of the suggested measures it will be possible to prevent the disease becoming epidemic, but it can safely be asserted that the observance of these rules will diminish the incidence of the infection.

The organism responsible for the epidemic of influenza has not been definitely identified. The weight of evidence still points, however, to the bacillus, called the bacillus of Pfeiffer being the cause: at all events it is intimately associated with the disease. Judging from clinical and epidemiological standpoints, the disease which appeared in India was identical with the last great pandemic of influenza which occurred in 1890-91. In the absence, however, of definite proof of the casual organism, this *statement is a surmise although a probable one.*

Influenza is a disease which exhibits an intense infectivity and an incubation period which is relatively very short, *i.e.*, from 6 to 48 hours. It is commonly believed that the disease is spread by the infected secretions of the throat and nose of infected persons finding lodgment in the nose and throat of uninfected people. The commonest means by which this occurs is by coughing and sneezing, especially in confined spaces. Methods of prevention, then, will consist of preventing communication of infection by these channels.

These measures may be considered from two standpoints.

*I.—Procedure recommended for Military, Municipal, and other Administrative Bodies:*

It is realized that no legislative measnres can be adopted in most communities and moreover since the limitation of an epidemic of this nature depends more upon invidual than upon legal enactments, the following general recommendations are made.

*A.. Education of the public with regard to such facts as the following :—*

(1) The golden rule is to keep fit and avoid infection as much as possible.

(2) The way to keep fit is to cultivate healthy and regular habits, take regular exercise, to eat good food, and to avoid fatigue, chill and alcoholism. Healthy living does not of itself ensure against attack, but it makes the patient better able to withstand the complications which may kill.

(3) The earliest symptoms of influenza are usually those of a severe feverish cold: it is most infectious in the earliest stages; it is

spread by discharges from the mouth and nose; it kills mainly by its complications and every person suffering from the disease, no matter of how mild a form, is a danger to others. For these reasons coughing, sneezing, spitting and hawking in public places are dangerous.

(4) It is not always possible to avoid infection, but the risks can be lesseued by—

(*a*) healthy living ;

(*b*) working and sleeping in well-ventilated rooms ;

(*c*) avoiding crowded gatherings and close ill-ventilated buildings, or carriages ;

(*d*) wearing warm clothing ;

(*e*) irrigating the nose with saline solution (see later) ;

(*f*) wearing in certain instances a mask of prescribed pattern (see later)

(5) Do not lay too much emphasis upon drugs in the hope of preventing infection

(6) Those attacked should

(*a*) go to hospital or go home, go to bed and keep warm ;

(*b*) call in a doctor, where possible ;

(*c*) occupy, if possible, a separate bedroom or a bed that is screened off from the rest of the room ;

(*d*) when coughing or sneezing hold a handkerchief in front of the mouth, the handkerchief should be boiled or sterilized in antiseptics, or burnt if of paper. Similar attention should be paid to linen, etc., soiled hy discharges, by persons suffering from common cold or catarrh, as it is undoubted that in apparently healthy communities the infective agents of influenza are frequently present in such persons,

(*e*) Do not return to work, through a scense of duty, until convalescence is well established, and during convalescence be extremely careful to avoid chill which may induce a relapse or complications ;

(*f*) avoid meetings and places of entertainment for at least one week after the temperature has become normal.

Such education we believe should be made compulsory in all schools and colleges ; the press might and by giving publicity to such measures as are recommended for adoption.

*B. The closing of meeting places, schools, colleges, cinema halls, dancing halls, skating rings, churches, etc.*—Regarding these measures universal recommendations cannot be made. The widespread depression in the minds of the general population during epidemic times must be remembered. Such depression may be a predisposing factor in the occurrence of the disease, and it is felt that if measures were passed such as closing all theatres and resorts of amusement, the effect on the public health might be worse than if nothing was done at all.

Again, take the instance of schools ; if children were taken from well ventilated schools they might add to the congestion of already overcrowded houses. This matter must be left to individual localities to settle, bearing in mind that it is necessary to limit the number of unnecessary gatherings and that it is necessary to keep up the moral of the public. In this connection attention should be drawn to the dangers associated with travelling in cars and carriages. It is believed that a fertile source of the spread of infection occurs in overcrowded railway carriages, tram cars, etc. The prevention of overcrowding should especially be insisted on at such times and scrupulous cleanliness of carriages and cars be enforced. It is believed that much mischief was done in the last epidemic by the exodus from cities of panic-stricken populations, and facilities for such exodus should be prohibited.

*C. The wearing of face masks.*—Opinions are divided as to the efficacy of this measure : it largely depends upon their construction. The masks should be of very close woven muslin or gauze. Recent work in America would seem to point to a gauze with a mesh 44 by 40 to the inch : three to six layers of fine muslin should form the mask and they should be applied so as to cover the nose and mouth completely. The gauze is cut 8 inches wide and 23 inches long. Details of the method of manufacture are given in a foot-note.*

The use of these masks should be made compulsory among nurses and attendants in hospitals which admit influenza patients and might be adopted in houses where cases of influenza are present and among volunteers and others who come in contact with the

*The gauze 44 by 40 mesh is cut 8 inches wide and 23 inches long. The sides and one end are turned down one quarter inch. It is folded twice, the unturned end first, making a 7½ inch square. The opposite diagonal corners are cut off 1 inch and the raw edge is turned in one-half inch. It is stitched firmly all around. A 1 inch dart 1½ inches long is taken up at the middle of each side of the mask. A 14 inch tape is sewed on the opposite uncut corners. This mask has the advantage of covering the nose and mouth and in making the traction on the chin and now drawing on the nose and lips.

sick. The wearing of a face mask, whilst having a certain protective action, exerts an educative influence upon the patients. Though it would be more reasonable for the patients to wear a mask, this is impracticable in view of further impending respiration which already may be difficult.

As there is a small possibility that droplets of infective matter lodging in the eyes may give rise to the disease, the use of goggles by such attendants may also be recommended.

Another suggested use of face masks is by barbers, dentists, etc., whose occupation brings them into close contact with a number of persons, and who if incubating the disease may otherwise infect their clients.

*D. Isolation.*—*It is feared that insistence* upon isolation of influenza cases in India is impossible. For one thing there is not sufficient hospital accommodation. Every case, however, of influenzal, pneumonia should be rigorously isolated as the germs present in post-influenza pneumonia are themselves infectious, altogether apart from the causative organisms of influenza. Hospitals should attempt to separate uncomplicated influenzal cases from those suffering from secondary pneumonia.

*B. Sprays and Gargles.*—The use of disinfectant sprays and gargles is not recommended. Disinfectants are apt to remove the protective mucus of the throat and mouth; to cause irritation of the mucus membranes or lining membranes of these cavities and so predispose to the lodgment of infective material. They can hardly be used strong enough to be protective without causing violent irritation.

The use, however, of a solution of common salt one teaspoonful to a pint of 20 ozs. might be productive of good results if used as a gargle or sniffed up the nose, as it will produce an excess of the normal secretions of the nose and throat and this leads to the washing-out of micro-organisms.

*F. Disinfection.*—With regard to the disinfection of infected rooms, it seems fairly established that ordinary cleansing with water, airing, and sunning effect as much good as the use of actual disinfectants In addition, as already suggested, all handkerchiefs, sheets and clothings recently soiled (within 48 hours, as drying kills the infective agent) should be boiled or otherwise sterilized.

The periodic disinfection on the above lines of public places, *e.g.*, railway waiting rooms, trams, rolling stock, dak bungalows, serais, etc., which in epidemic times may be taken to be infected, is also strongly recommended.

*G. Quarantine.*—A limited measure might be practised by local institutions such as resident colleges, schools, asylums and jails. A jail, for example, situated in an epidemic area, might be rigid quarantine be reasonably certain of keeping out infection or at least of delaying its appearance. There was evidence of the efficiency of this measure in certain jails in India during the last epidemic.

*H. Notification.*—Notification of all cases of influenza would be obviously impossible. A limited notification might, however, be adopted at ports; some value being likely to result from the notification of infected ships and the prompt removal to hospital of actual cases.

Notification of influenzal pneumonial is now compulsory in England and in Australia. This measure in India would only be possible amongst the military and in civil in large towns where the Municipal Acts already *permit of the notification of all forms of* infectious disease.

II. PROPHYLACTIC VACCINATION.

A mixed vaccine has been prepared and will be available in India in moderate *quantities. Until* its efficacy or its non-efficacy is established, we can offer no authoritative statement as to the advisability of general prophylatic inoculation.

*III. MEASURES FOR ORGANIZED* RELIEF.

(*a*) Local authorities should have ready lists of their requirements for doctors, nurses, the additional hospital staff required, such as sweepers, bhistis, etc. mask makers, *motor* cars, ambulance drivers and volunteers of all kinds necessary for the actual treatment of the sick; and have noted, as far as possible, the actual persons who could prove useful in various accessory capacities. A canvass of private cars which people are willing to lend as ambulances, might advantageously be made. Further, the names of volunteers, for district visiting and localization of cases should be noted.

In this connection too it would be well for municipalities and other local authorities to entrust the actual arrangements prior to an epidemic and preparatory for it, to some already organized body such as the St. John's Ambulance Brigade Nursing Association, as in addition to the above, hospital requisites must be obtained, *e.g.*, beds, mattresses, etc. Lists of what are available should be made ready.

(*b*) Resources of men and material should be centralized under one central authority.

(*c*) The work of District visitors in a house-to-house canvass, referred to under paragraph (*a*) above, should be co-ordinated. Valuable information would thus accrue as to the actual extent of the disease. These visitors should also be instructed as to the type of case and home which would justify home treatment being adopted, and when hospital treatment is necessary.

A central clearing house or a bed dispensary might be instituted in large towns and severe cases be transferred from these to the hospitals. Hospitals should be warned to admit only severe cases as their resources will be taxed to the uttermost.

(*d*) It is needless to say that all other public health organizations, such as vaccination and plague organization staff, etc., should be utilized for the various measures of influenza epidemic control.

## THE INFLUENZA EPIDEMIC.

### How to Douch.

The following press communique has been issued by the Education Department:—

The method and value of nasal douching as a preventive of influenza.—The sanitary commissioner with the Government of India recommends the douching of the nasal cavities and throat as a preventive of influenza. The following description of the method of douching is published for general information:—

(*a*) Dissolve one teaspoonful of salt in a pint of warm water.

(*b*) Gargle the throat with some of the solution.

(*c*) Place the remainder of the solution in a basin.

(*d*) Immerse the nostrils in the solution.

(*e*) Sniff slowly some of the solution up the nostrils until it is felt at the back of the throat.

(*f*) Raise the head from the basin and allow the solution to flow from the nostrils into a bucket.

(*g*) Repeat this process two or three times.

The whole ritual should be carried out four or five times daily. The above procedure has been reported to have given very good results during the last epidemic in South Africa. For instance, out of 91 persons, mostly nurses, who were especially exposed to infection, only three developed light attacks.

## STATISTICS.

### Cotton Seed Oil, &c.

*The following statement,* compiled in the Department of Statistics, India, shows the quantity and value of cotton seed oil, groundnut oil and oilcakes (Indian Merchandise) exported by sea from British India to foreign countries during the month of March, 1919:—

| | March 1919. | |
|---|---|---|
| | Quantity | Value |
| | Gallons | Rs. |
| Oils— | | |
| 1 Cotton seed ... ... | Nil | Nil |
| 2 Groundnut ... ... | | |
| To countries other than United Kingdom ... | 5,177 | 13,711 |
| Share of Madras ... | 3,890 | 9,690 |
| ,, Burma ... | 1,200 | 3,601 |
| Oilcakes— | | |
| 1 Castor cake— | cwts. | |
| All to Ceylon ... | 5,526 | 30,229 |
| 2 Cotton cake— | | |
| All to United Kingdom ... | 16,964 | 75,357 |
| 3 Groundnut cake— | | |
| To United Kingdom ... | 53,658 | 190,862 |
| To Ceylon ... | 77,005 | 392,341 |
| To other countries ... | 34,349 | 1,36,670 |
| Total ... | 165,012 | 7,19,873 |
| 4 Linseed cake— | | |
| All to United Kingdom ... | 13,800 | 55,012 |
| 5 Rape and Sesamum cake | | |
| To United Kingdom ... | 1,578 | 6,874 |
| To Ceylon ... | 31,251 | 2,57,418 |
| To Japan ... | ... | ... |
| Other countries ... | 140 | 588 |
| Total ... | 32,969 | 2,64,880 |
| 6 Others ... | 10,380 | 42,535 |

Statistics of the export trade of Yatung (Tibet) for the past two years are given below :—

| | | 1918-19. | 1917-18. |
|---|---|---|---|
| | | Rs. | Rs. |
| Merchandise | ... | 27,25,721 | 21,05,435 |
| Treasure | ... | 3,45,880 | 2,68,958 |
| Total | ... | 30,71,601 | 23,74,393 |

The export of merchandise last year consisted of raw wool, ponies, mules, sheep, yak-tails and musk. The largest article of export was raw wool weighing 79,179 maunds to the value of Rs. 2,175,114 as compared with 76,816 maunds to the value of Rs. 18,44,967 for the year 1917-18. The value of imports was as follows :—

| | | 1918-19. | 1917-18. |
|---|---|---|---|
| | | Rs. | Rs. |
| Merchandise | ... | 14,38,874 | 11,86,448 |
| Treasnre | ... | 40,420 | 5,000 |
| Total | ... | 14,79,294 | 11,91,448 |

The import of merchandise consisted of cotton and woollen piece-goods, precious stones, tobacco, silk and metals. The largest item of import was cotton piece-goods, of foreign manufacture weighing 701 maunds to the value of Rs. 137,143 as compared with Rs. 164,273 for the year 1917-18. Next come cotton piece-goods of Indian manufacture weighing 1,981 maunds valued at Rs. 2,28,781 as compared with Rs. 1,04,242 for the year 1917-18. It will be noticed that there is an increase of Rs. 6,97,208 in the export trade and an increase of Rs. 2,87,846 in the import trade as compared with the figures of the previous year. The Tibetan traders of the Chumbi Valley are still flourishing with the carrying trade between Phari and Kalimpong. The number of traders in the Yatung Bazaar is very limited.

The *Dominion Bureau of Statistics* has completed its census of the manufactures of Canada for the year 1917, and the preliminary totals are now available, says the *Board of Trade Journal*. The returns cover 34,380 establishments and show a remarkable development in this branch of Canadian industry when compared with the census of 1915, as summarised in the following table :—

| | 1917 Dols. | 1915 Dols. | Increase Dols. |
|---|---|---|---|
| Capital invested ... ... ... ... | 2,772,517,680 | 1,994,103,272 | 778,414,408 |
| | No. | No. | No. |
| Employees on salaries ... ... ... ... | 73,598 | 52,683 | 20,915 |
| | Dols. | Dols. | Dols. |
| Salaries paid ... ... ... ... | 95,983,506 | 60,308,293 | 35,675,213 |
| | No. | No. | No. |
| Employees on wages (including piece-workers) ... | 619,473 | 462,200 | 157,273 |
| | Dols. | Dols. | Dols. |
| Wages paid ... ... ... ... | 457,245,456 | 229,456,210 | 227,789,246 |
| Cost of materials ... ... ... ... | 1,602,820,631 | 802,133,862 | 800,686,769 |
| *Value of products* ... ... ... ... | *3,015,506,869* | *1,407,137,840* | *1,608,369,729* |

The Gross value of goods made in Canada in 1917, amounted to 3,015,506,869 dols., and the cost of materials was 1,602,820,631, leaving a net value added by the process of manufacture of 1,412,686,238 dols., or 5,549,098 dols more than the gross value of production in 1915. The twenty leading industries with the grass and net values of their production are given below in order of precedence:—

| | Gross value Dols. | Net value Dols. |
|---|---|---|
| Flour and grist mill products ... ... ... | 224,191,735 | 40,604,399 |
| Steel furnaces and rolling mills ... ... ... | 170,679,000 | 62,040,044 |
| Slaughtering and meat packing ... ... ... | 153,279,252 | 36,082,497 |
| Long products ... ... ... ... ... | 115,884,905 | 75,159,877 |
| Munitions ... ... ... ... ... | 112,866,838 | 70,240,235 |
| Pulp and paper ... ... ... ... ... | 96,340,324 | 61,627,462 |
| Butter and cheese ... ... ... ... | 85,734,339 | 13,719,662 |
| Cars and car works ... ... ... ... | 78,564,527 | 39,884,077 |
| Bread, biscuits and confectionery ... ... | 77,223,581 | 33,022,111 |
| Sugar, refined ... ... ... ... | 73,329,260 | 20,149,349 |
| Smelting ... ... ... ... | 69,262,673 | 33,591,253 |
| Foundry and machine shop products ... ... | 66,945,483 | 43,322,382 |
| Iron and steel products ... ... ... ... | 58,797,766 | 26,777,534 |
| Building and contracting ... ... ... | 54,668,255 | 32,927,335 |
| Automobile ... ... ... ... | 54,466,273 | 18,880,453 |
| Slaughtering, not including meat packing ... ... | 53,441,466 | 14,771,901 |
| Boot and Shoes ... ... ... ... | 49,170,062 | 22,389,519 |
| Electric light and power ... ... ... | 44,536,848 | 44,536,848 |
| Leather, tanned, curried and finished ... ... | 41,117,128 | 14,492,651 |
| Electric apparatus supplies ... ... ... | 40,204,245 | 20,046,238 |

The totals of the twenty leading industries in gross and net value of production were 1,720,700,960 dols., and 724,266,227 dols., and they represent respectively 57 per cent and 51 per cent of the grand totals for the Dominion.

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The *Board of Trade Journal* says:—Statistics of the production of the most important metallic and non-metallic minerals of Japan proper, issued by the Japanese Bureau of Mines, are as under (in long tons):—

| Minerals | 1917 Tons. | January-June. 1918. Tons. |
|---|---|---|
| *Metals.* | | |
| Antimony— | | |
| Refined ... ... | 6,562 | (a) |
| Crude ... ... | 10 | (a) |
| Chromic iron ore ... | 8,798 | 1,173 |
| Copper ... ... | 63,812 | 41,787 |
| Gold— | | |
| Lode ... ... | (b) 226,122 | (b) 122,632 |
| Placer ... ... | (b) 1,402 | (a) |
| Lead ... ... | 15,557 | 2,419 |
| Manganese ore ... | 50,552 | 12,319 |
| Molybdenum ... | 12 | (a) |
| *Platinum, placer* ... | (b) 132 | (a) |
| Quicksilver ... | 2 | 1 |
| Silver ... ... | (b) 7,111,720 | (b) 3,166,344 |
| Tin ... ... | 209 | 87 |
| Tungsten ... ... | 721 | 291 |
| Zinc (metal) ... | 53,852 | (a) |
| *Non.Metals.* | | |
| Asphalt ... ... | 3,811 | 1,414 |
| Coal— | | |
| Bituminous ... | 25,939,637 | 13,999,517 |
| Lignite ... ... | 150,400 | 76,023 |
| Graphite ... ... | 1,308 | 538 |
| Petroleum crude ... | (c) 2,850,159 | (c) 1,220,968 |
| Phosphate rock ... | 119,682 | 112,519 |
| Pyrites, iron ... | 119,426 | (a) |
| Sulphur ... ... | 116,120 | 34,963 |

(a) Figures unobtainable.
(b) Troy ounces.
(c) Barrels of 42 gallons.

## MYSORE ECONOMIC CONFERENCE.

### Progress in the Districts.

### Chitaldrug.

AGRICULTURE.

*Ploughing Demonstrations.*—Ploughing demonstrations were held in four villages and Jaggery boiling demonstrations, in three places.

*Verity Ploughs.*—Seven Verity ploughs were ntroduced.

*Formation of a Nursery.*—A small nursery of poppy seedlings was formed in Chitaldrug for free distribution to the growers.

EDUCATION.

*A Reading Room.*—A reading room was started at Nulenur in Holalkere Taluk.

INDUSTRIES AND COMMERCE.

*A Shoe Factory.*—The question of starting a Shoe Factory at Chitaldrug by Mrs. Arbuthnott was discussed and a loan of Rs. 500 was resolved to be granted on proper security and also help her with a loan of a sole stitching machine and up-to-date tools.

### Shimoga.

Agriculture.

*Cattle Show at Shimoga.*—In connection with the holding of a Cattle Show at Shimoga the Committee resolved to hold it on *Phalguna Suddha Bidige* every year.

EDUCATION.

*A Panchama School.*—A Panchama School was started at Tyajavalli.

*A Grant-in-aid School.*—A grant-in-aid school was started at Korlahalli village and a contribution of Rs. 48 was collected towards the pay of the teacher.

*A Reading Room.*—A reading room was started at Balekoppa.

INDUSTRIES AND COMMEPCE.

*A Furniture Factory.*—In connection with the subject of starting an up-to-date Furniture Factory at Shimoga, the Committee thought it very necessary that a further attempt should be made in view of the many facilities available in Shimoga for starting such a factory.

## BOOKS IN BRIEF.

**Hand-book of Plantation, Fibre and Fruit and Industry.**—*By J. K. Sircar, Calcutta.*

This is a little book giving much useful information on the plantain fibre and fruit industries. The uses of the plaintain fibre, methods of extraction, machinery required, with lists of machine makers and marketing of fibre are a few of the matters dealt under the head of "fibre." As regards the "fruit," its conversion into plaintain meal is given, with chemical analyses of some by various chemists. The preperation of the meal on a commercial scale also receives attention. Altogether the book is a thoroughly practical one and being translated, ought to prove useful to those interested in the plantain fibre and fruit industries in India.

**Hints to Farm Pupils.**—*By E. W. Lloyd, late Lieutenant T. P. Res., London—John Murray. 2s. 6d.*

This is a capital little book for those starting to learn farming. Lient. Lloyd writes as a practical farmer and what he says is out of the abundance of his own experience. The book ought to appeal to a wide class of people now found taking increasing interest in farming in this State. It is books of this kind that those intending to take advantage of the Large Landed Estates Scheme should study for picking the "hints" they want.

**School and Home Gardening.**—*By K. C. Davis, Ph.D., Knapp School of Country Life Philedelphia and London, J. P. Lippincott Company. 4s. 6d.*

This is just the sort of publication we have long been looking for, for the use of young people. The authoress has understood aright, in our opinion, the objects and aims—nay the spirit—of the school garden movement and has provided in her book useful hints and practical instruction for both studentsand teachers alike. Leaders in the garden work movement would also do well to study the book, especially the first two chapters. We have no doubt that teachers in this country will find the volume a most helpful one. The illustrations, which number 160 in all, enhance the value of the publication. We shall be glad if the book has the attention it deserves in this country.

## RECENT PUBLICATIONS.

**Vegetable Gardening.**—*By J. S. Chisholm, Senior Lecturer in Horticulture, Edinburgh and East of Scotland College of Agriculture. (The People's Books Series.) 6½×4½. 126 pp. Nelson. 1s. 3d. n.*

**Our National Forests.**—*A short popular account of the work of the United States Forest Service on the National Forests. By Richard H. Donai Boerker, Arboriculturist Department of Parks, City of New Yark. 8×5½, lxix.+238 pp. Macmillan Co. 12s. 6d. n.*

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**The Forgotten Man,** *and other Essays. By William Graham Sunner. Edited by Albert Galloway Keller. 9×6½, 559 pp. New Haven, Yale University Press. London. Milford. 10s. 6d.*

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